Thesis accepted for the award of the Degree.

With compliments

19.4.1968

STUDIES ON CORALS

THESIS

SUBMITTED TO THE

UNIVERSITY OF KERALA

FOR

THE DEGREE OF DOCTOR OF PHILOSOPHY

IN

ZOOLOGY

(MARINE BIOLOGY)

*

APRIL 1967

C.S. GOPINADHA PILLAI, M.Sc.

Certified that the Thesis entitled 'Studies on Corals' is a bona-fide record of the research work done independently by Shri C.S. Gopinadha Pillai, under my guidance and supervision at the Central Marine Fisheries Research Institute, Mandapam Camp during the period April 1964 to April 1967 and that no part thereof has previously formed the basis for the award to the candidate of any Degree, Diploma, Associateship, Fellowship or other similar title of any other University or Society.

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PREFACE

Around India coral formations are found in the Gulf of Kutch, in the Laccadive sea, in Palk Bay and Gulf of Mannar sides of Mandapam and Rameswaram Island, and encircling the various small islands lying between Rameswaram and Tuticorin, at the northern and southern ends of Ceylon and around Andaman and Nicobar Islands. Corals are extensively used at present as building blocks and a substitute for granite chips to mettle roads and in the preparation of lime, cement and Calcium carbide. In spite of their economic importance and scientific interest, a perusal of the literature on the group would show that hardly any attempt has been hitherto made for a comprehensive study of the coral fauna of the seas around India; though the coral faunas of the western and eastern sectors of the Indian Ocean and most of the regions in the Pacific have been well described by various authors. Therefore it was felt desirable to study the coral fauna of the region that lies between the Maldivian and the Malaysian coral formations and to fill the gap in our knowledge of the distribution of these marine animals in the great Indo-Pacific. To add to this the recent revisions of the group by different workers have necessitated a study to ascertain the present status of the various genera and species of corals reported from this area by early workers. Hence the present work was undertaken in April 1964 at the suggestion and guidance of Dr. S. Jones, Director, Central Marine Fisheries Research Institute, Mandapam Camp.

A systematic and ecological analysis of the stony corals of the seas around India is presented in this Thesis entitled 'Studies on corals', in two parts. In the systematic part of this work a total of 125 species of corals belonging to 34 genera and one subgenus are described in detail, majority of them being hermatypic forms. Besides these, all the previously recorded hermatypic and ahermatypic genera and species from this area are mentioned in the text for the sake of completeness of the account. Three species viz. Montipora manauliensis, Porites jonesi and Dendrophyllia indica are described as new to science. One Goniopora and two Porites described by Bernard (1905, 1906) but not named by him according to binomial system are named G. nigra, P. exserta and P. mannarensis respectively. This work adds a total of 68 species to the corals already known from the coastal waters of India. The present work has greatly extended the geographic distribution of several species in the Indo-Pacific either westward or eastward. Montipora granulosa Bernard, M. turgescens Bernard, M. elschneri Vaughan, M. verrilli Vaughan and M. composita Crossland are first time recorded here from the Indian Ocean.

In part II of this work, the results of a preliminary study on the ecology of the corals of Mandapam and a discussion on the composition of the coral fauna around Mandapam are presented in two chapters.

ACKNOWLEDGEMENTS

I take this opportunity to express my deep sense of gratitud and great indebtedness to Dr. S. Jones, D.Sc., F.N.G.S., F.A.Sc., F.Z.S.I., Director, Central Marine Fisheries Research Institute,

Mandapam Camp for suggesting the problem, his valuable guidance and constant encouragement. My most sincere thanks are due to him for the unfailing and unfaiding interest which he has shown at every stage of this work. My grateful thanks are due to Dr. R.V. Nair, M.Sc., Ph.D., F.Z.S.I., Senior Research Officer, Central Marine Fisheries Research Institute for critically going through the part of my Thesis dealing with the systematics and suggesting many improvements and to Dr. N. Balakrishnan Nair, M.A., D.Sc., F.Z.S.I., Reader in Oceanography, University of Kerala for his helpful criticism on the section dealing with the ecology. My thanks are also due to Shri K. Virabhadra Rao, M.A., M.Sc., Senior Research Officer, and Dr. P.S.B.R. James, M.Sc., Ph.D., Assistant Research Officer, of this Institute for reading through the Thesis and offering many helpful suggestions. I sincerely thank Dr. M. Umamaheswara Rao, M.Sc., Ph.D., Assistant Research Officer of this Institute, for his valuable help during the survey of the traverse mentioned in Part II Chapter I of this work, and for the names of the algae mentioned herein. The author is indebted to Shri K. Rangarajan, M.Sc., Assistant Research Officer and to Shri D.B. James, M.Sc., of this Institute for collections from Andaman Islands. My sincere thanks are also due to my colleague Shri P.A. Thomas, M.Sc. for a collection from Tuticorin and for the names of sponges mentioned in this work, and to Shri Alimanikfan of this Institute for a collection from the Laccadives. The services of Shri Moideen and Shri Kathavarayan, Fieldmen of this Institute and the crew of 'M.L. Mathi', during the author's collection trips are gratefully acknowledged. Thanks are also due to Shri Satyaprakash Ghanshani, Artist Photographer of this Institute for the photographs of the corals presented in this work.

The author is thankful to the various officers of the Central Marine Fisheries Research Institute, whose names are not mentioned here, for their willing and valuable help.

I sincerely thank Prof. J.W. Wells, Cornell University, New York, for his kind help in clearing some of my doubts in naming a few species. My grateful thanks are due to Siro Kawaguti of the Okayama University, Japan and Dr. Vervoort, Curator, Rijksmusem Van Natuurlijke Historie, Leiden, for helping me with a few publications on the group that were not readily available in this country.

I am grateful to the Ministry of Education, Government of India, for the award of a Senior Research Scholarship from April 1964 to April 1967 during the tenure of which the present investigation was carried out.

C.S. GOPINADHA PILLAI.

STUDIES ON CORALS

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INTRODUCTION

Historical

Stony corals have received the attention of naturalists even from the early seventeenth century. A detailed review of the early literature on the group is presented by Vaughan and Wells (1943). The major, earlier contributions to the recent corals of the Indo-Pacific, are that of Forskål (1775), Klunzinger (1879) and Von Marenzeller (1906) from the Red Sea; Dana (1846) and Quelch (1886) from Fiji; Studer (1880) from Singapore; Ridley (1883) and Ortmann (1897) from Ceylon; Basset Smith (1890) from the China Sea; Gardiner (1904, 1905) from the Maldives and the Laccadives; Studer (1901) and Vaughan (1907) from the Hawaii and Vaughan (1907a) and Gravier (1911) from the Somaliland. In recent years there are several substantial contributions on this group. Vaughan (1918) has published a monograph on some shoal-water corals from Murray Island, Cocos-Keeling Islands and Fanning Island. Horst (1921, 1922a) has reported on the Fungida and Rupsammidae collected during the Siboga Expedition. The same author (Horst, 1922, 1926) has also reported on the Agarciidae and Rupsammidae collected by the 'Percy Sladen Trust Expedition to Indian Ocean' in 1905, an expedition that also provided materials which formed the basis of Gardiner's (1909) and Matthai's (1914) classical revisions of the 'Fungidae' and the 'recent colonial Astraeidae possessing distinct corallites' respectively. Matthai (1924) has studied part of the coral collection of the Indian Museum,

Calcutta, obtained primarily from the Red Sea, Western Indian ocean, Andaman Islands and Mergui Archipelago. Unfortunately his earnest hope to review the remaining families in the collection on a subsequent occasion did not materialise. In a comprehensive monograph, Hoffmeister (1925) has brought to light the coral fauna of Samoa alongwith a few from Fiji. Faustino (1927) and later Nemenzo (1955, 1960, 1960a, 1964) have made the coral fauna of Philippines fairly well known. Thiel (1932) has greatly extended our knowledge of the stony corals of the Banda Sea. Part of the recent reef-building corals of Japan and the South Sea Islands under the then Japanese mandate was monographed by Yabe, Sugiyama and Eguchi (1936). Eguchi (1938) himself, has later studied the coral fauna of Palau Islands and reported a total of 141 species belonging to 45 genera. In two papers, Gardiner and Waugh (1938, 1939) have described the corals collected during the 'John Murray Expedition' to the Indian Ocean. With his intimate knowledge of Forskål's collection grounds, gained by seventeen years of residence at Dungunab and an additional eight years at Ghardaqa on the Red Sea coast and with his wide experience with corals and coral reefs, Crossland (1941) proved himself an unquestionable authority to comment 'on Forskal's collection of corals in the zoological museum of Copenhagen'. The 'revision of the suborders, families and genera of Scleractinia' by Vaughan and Wells appeared in 1943. The corals of the Natal coast have provided materials to Crossland (1948) for one of his publications on the group. Wells (1950) has extended greatly our knowledge of the coral fauna of the Cocos-Keeling Atoll. The coral collections of the

Great Barrier Reef Expedition, 'comprising 174 species divide among 54 genera', the largest collection of corals from any a made until then, was reported by Crossland (1952). Durham an Bernard (1952) have studied the stony corals collected by Velero III and Velero IV, during their cruises in the eastern Pacific. The authors have described a total of 98 species ass able to 39 genera from Gulf of California, Galapagos and othe offshore islands. This includes 1 new genus and 25 new speci majority of them being ahermatypic. Kawaguti (1953) has liste coral fauna of Formosan (Taiwan) waters. In his 'recent coral the Marshall Islands', Wells (1954) has reported a total of 2 species referrable to 62 genera; hermatypic and ahermatypic to Purchon (1956) has found 73 species of corals in Raffles Light Singapore. Wells (1956) proposed a modification to the system classification of Scleractinia proposed by Vaughan and Wells. Stephenson and Wells (1956) and Stephenson et. al. (1958) have listed the fauna of Low Isles, Queensland. Wells (1961) has p lished a note on the Scleractinia of New Caledonia, to be fol by his (Wells, 1962) descriptions of two new species of coral Australia. The extant Scleractinia of New Zealand has receiv attention of Ralph and Squires (1962). We have the works of Squires (1961, 1962a and 1964) on the deep sea corals of Scot of the Ross Sea and of Chatham Islands respectively. Very re the stony corals of the Addu Atoll of the Maldives have been by Wells and Davies (1966).

As a matter of fact, only very little has been written the coral fauna of the seas around India. The earliest atte to study the recent corals of India, seems to be that of

Edgar Thurston, who has collected several specimens from Rameswaram, at a time, as Foote (1888) has aptly commented, when the place was "the most out of the way, an un-get-at-able" one in South India. Thurston's collections were later studied by Brook (1893) and Bernard (1897, 1905). Brook (op. cit.) has recognised 8 species of Acropora from Rameswaram, out of which A. multicaulis, A. thurstoni and A. indica were described as new. Alcock (1893) has published an account of some ahermatypic corals from the seas around India. The same author (Alcock, 1898) has described 25 species of 'deep-sea Madreporaria' dredged by the Royal Indian Marine Surveyship "Investigator", from a depth of more than hundred fathoms, around Andaman Islands, off Madras, Konkan coast, off Kerala, Laccadives and Maldives. Bernard (1897) has mentioned the occurrence of Montipora divaricata (= M. ramosa) and M. foliosa at Rameswaram. He (Bernard, 1905) has also described 14 specimens of Porites collected by Thurston from the living and subfossilized reefs of Rameswaram. Gardiner (1904, 1905) has recorded 27 species of corals assignable to 17 genera from Minicoy. Matthai's (1924) work on the coral collections of Indian Museum, Calcutta has already been alluded to. He (Matthai, 1924a) has reported on a species of Culicia from Chilka Lake. In his catalogue of the 'Meandroid Astraeidae', Matthai (1928) has reported the occurrence of Symphyllia recta, S. radians and Platygyra lamellina, around Mandapam. Gravely (1927) has reported on the Scleractinia of the littoral waters of Krusadai Island and nearby places. This includes 22 genera and 30 species. He has only mentioned the occurrence of the genera Goniopora and Porites. Sewell (1935), during his geographic and oceanographic researches in Indian waters has

collected 13 species of corals belonging to 8 genera from the raised reefs of Rameswaram and Mandapam. Gravely (1941) has noted the presence of the remnants of Pocillopora damicornis at the Madras beach.

MATERIAL AND METHODS

The materials forming the basis of the present work are species of stony corals, collected from the Laccadives, Tuticorin, Palk Bay and Gulf of Mannar around Mandapam and Andaman Islands (Pl. I, figs. 1-3). The details of collections are presented below. Complete list of genera and species collected from each locality is given in table I.

Laccadives: A few specimens were obtained from Chetlat Island (Long. 72° 40'E, Lat. 11° 45'N) and Minicoy (= Minikoi) (Long. 73° E, Lat. 8°, 15'N) situated respectively at the extreme northern and southern ends of the Laccadive Archipelago. This collection comprised 18 species divided among 14 genera.

Tuticorin: (Long. 78° 9'E, Lat. 8° 48'N): A small collection from this place includes 10 species belonging to 9 genera; majority of them being first record to this place.

Mandapam and adjacent areas: A thorough collection of corals of both Palk Bay and Gulf of Mannar around Mandapam from the following localities was attempted.

Mandapam (Palk Bay) (Long. 79° 30'E, Lat. 9° 16'40" N): A detailed account of the reefs and their fauna is presented in chapter I part II of this work.

Mandapam (Gulf of Mannar): Both the outer and inner sides of the granite wall of the dock-yard afford substratum to a luxuriant growth of corals. About a kilometer west of the dock-yard, where elevated blocks of sand stones are seen on the beach, scattered colonies of corals are met with on the sides of large rocks, the top of which will be exposed at low tides.

Lying close together, along the Mandapam peninsula in the Gulf of Mannar, there are a few islands (Long. between 79° 3' E and 79° 14' E and Lat. between 9° 11' N and 9° 18'N) which are actually part of a long chain of small islands between Tuticorin and Rameswaram. They include the Shingle Island, Krusadai Island, Pullivasal and Pulli Islands, New and Manauli Islands and Hare Island. Each is considered separately below.

Shingle Island: This small island is notable for the large quantity of coral shingle washed ashore. The fauna is not much different from the adjacent Krusadai Island.

Krusadai Island: The availability of freshwater has made the human habitation possible in this island. The northern and southern sides of this island have well developed fringing reefs though they are dying out at present. The mighty waves splashing on the reef make the approach to it extremly difficult. Collections are made from the lagoon, which harbours a rich coral fauna.

Pullivasal and Pulli Islands: These two islands lie close together . Collection is made at Pulli Island. The fringing reef at the southern side of this island is dying out.

The northern side is muddy and a considerable area gets exposed at low tides.

New and Manauli Islands: These are considered together not only for their nearness but for their faunastic similarities. The fringing reefs around these islands are very rich both in the number and abundance of coral species.

Mare Island: This island lie further west of Manauli Island and is the largest of all considered. The eastern and northern sides of this island harbour a rich coral fauna.

Andaman Islands: The present collection also includes 25 species of corals belonging to 12 genera, collected from the vicinity of Port Blair (Long. 92° 46' E, Lat. 11° 41' N).

The various localities around Mandapam, were visited in a motor launch, and the reefs were approached in a flat-bottomed dinghy during calm periods; i.e. from June to October in Palk Bay and from December to April in Gulf of Mannar. All specimens were procured from a depth not exceeding two meters at low tides. The specimens were collected by means of a hammer and chisel. As far as possible entire colonies (where their size permitted) and also very many samples of the same species according to their availability were collected with a view to studying their variation. Larger colonies were measured in the field. The abundance of the species, nature of the bottom, depth, colour in live condition, behavi[illegible] the polyps during day, i.e. whether expanded or not; we[illegible] noted. The specimens were brought to the aquarium, whe[illegible] were kept in fresh water for 3 to 6 days (depending on

of their polyps) to get their soft parts decayed. Later the skeletons were cleaned and transferred to the laboratory for subsequent examination. The terminology used in describing a coral skeleton, are those adopted by Ogilve (1896), Matthai (1926) and Moore, Hill and Wells (1966). In cases, where the present specimens are found to tally with earlier illustrations, reference is made to such works. Where, only the name of a species is mentioned in literature without description or figure, such records are referred to, alongwith the section on the geographic distribution of each species, and are not incorporated in the synonymy. The classification of Scleractinia adopted in this work is that of Vaughan and Wells (1943), as modified by Wells (1956).

TABLE I

ist of species described in this work, with their respective localities. enera and species are listed in the order of their treatment in the text. Those marked with an asterisk (*) are new records to India.

S. No.	Name of the species	Localities: Laccadives: Chetlat Is.	Laccadives: Minicoy	Laccadives: Tuticorin	Mandapam area: Mandapam (Palk Bay)	Mandapam area: Mandapam (Gulf of Mannar)	Mandapam area: Krusadai Is.	Mandapam area: Pulli Island	Mandapam area: Manauli and New Islands	Mandapam area: Hare Island	Andaman Islands
	Genus Psammocora										
1.	P. contigua (Esper)	x	x	-	-	-	x	-	-	-	-
	Genus Stylophora										
2.	*S. mordax (Dana)	x	-	-	-	-	-	-	-	-	-
	Genus Pocillopora										
3.	P. damicornis (Linnaeus)	x	x	x	x	x	x	x	x	x	x
4.	*P. danae Verrill	-	x	-	-	-	-	-	x	-	-
5.	*P. brevicornis Lama rck	-	-	-	-	-	-	-	-	-	x
6.	*P. verrucosa (Ellis and Solander)	-	-	-	-	-	-	-	-	-	x
**7.	*P. eydouxi Milne Edwards and Haime	-	-	-	-	-	-	-	-	-	-
	Genus Acropora										
8.	*A. intermedia (Brook)	-	x	-	x	-	-	-	-	-	-

from Keelakarai, Gulf of Mannar
= present.

Table I (contd.)

S. No.	Name of the species	Localities									
		Laccadives			Mandapam area						Andaman Islands
		Chetlat Is.	Minicoy	Tuticorin	Mandapam (Palk Bay)	Mandapam (Gulf of Mannar)	Krusadai Is.	Pulli Island	Manauli and New Islands	Hare Island	
9.	*A. formosa (Dana)	-	-	-	x	-	-	-	x	x	x
10.	*A. haimei (Milne Edwards and Haime)	x	-	-	x	-	-	-	-	-	-
11.	*A. nobilis (Dana)	-	-	-	-	-	-	-	x	x	x
12.	A. pharaonis (Milne Edwards and Haime)	-	-	-	x	-	-	-	-	-	-
13.	A. multicaulis (Brook)	-	-	-	-	-	-	x	x	-	-
14.	A. thurstoni (Brook)	-	-	-	x	-	-	-	-	-	-
15.	A. obscura (Brook)	-	-	-	x	-	-	-	-	-	-
16.	A. sp.	-	-	-	x	-	-	-	-	-	-
17.	A. corymbosa (Lamarck)	-	-	-	x	x	-	x	x	x	-
18.	*A. hyacinthus (Dana)	-	-	-	x	-	-	-	-	-	x
19.	A. surculosa (Dana)	-	-	-	-	-	-	-	x	x	-
20.	A. spicifera (Dana)	-	-	-	-	-	x	-	-	-	-
21.	A. indica (Brook)	-	-	-	-	-	-	-	x	-	-
22.	*A. squamosa (Brook)	-	-	-	x	-	-	-	-	-	-
23.	*A. hebes (Dana)	-	-	-	-	-	-	-	-	-	x
24.	*A. sp. cf. exigua (Dana)	-	-	-	x	-	-	-	-	-	-
25.	*A. humilis (Dana)	-	-	-	x	-	x	-	x	x	x
26.	*A. diversa (Brook)	-	-	-	-	-	x	-	-	x	x
27.	*A. digitifera (Dana)	-	-	-	x	-	-	-	-	-	-
28.	A. erythraea (Klunzinger)	-	-	-	-	x	x	x	x	x	-

Table I (contd.)

S. No.	Name of the species	Localities									
		Laccadives			Mandapam area						
		Chetlat Is.	Minicoy	Tuticorin	Mandapam (Palk Bay)	Mandapam (Gulf of Mannar)	Krusadai Island	Pulli Island	Manauli and New Islands	Hare Island	Andaman Islands
29.	*A. variabilis (Klunzinger)	-	-	-	-	-	-	-	-	-	x
30.	*A. ceylonica (Ortmann)	-	-	-	-	-	-	-	x	-	-
31.	*A. polymorpha (Brook)	-	-	-	x	-	-	-	-	-	-
32.	*A. syringodes (Brook)	-	-	-	-	-	-	-	-	-	x
+33.	*A. echinata (Dana)	-	-	-							-
34.	*A. procumbens (Brook)	-	-	-	-	-	-	-	-	-	x
	Genus Montipora										
35.	*M. subtilis Bernard	-	-	-	-	-	-	-	x	-	-
36.	*M. granulosa Bernard	-	-	-	-	-	-	-	x	-	-
37.	M. explanata Bruggemann	-	-	-	x	-	x	-	-	-	-
38.	*M. exserta Quelch	-	-	-	x	-	-	-	-	-	-
39.	*M. digitata (Dana)	-	-	x	x	-	x	x	x	x	x
40.	M. divaricata Bruggemann	-	-	-	x	-	x	x	x	x	-
41.	*M. turgescens Bernard	-	-	-	-	-	-	-	x	-	-
42.	*M. manauliensis sp. nov.	-	-	-	-	-	-	-	x	-	-
43.	*M. elscheneri Vaughan	-	-	-	-	-	-	-	-	x	-
44.	*M. monasteriata (Forskål)	-	-	-	-	x	-	-	-	-	-
45.	*M. venosa (Ehrenberg)	-	-	-	-	-	x	-	-	-	-
46.	*M. spumosa (Lamarck)	-	-	-	x	-	-	-	x	-	-

+Locality doubtful. See text.

Table I (contd.)

S. No.	Name of the species	Localities									
		Laccadives			Mandapam area						
		Chetlat Island	Minicoy	Tuticorin	Mandapam (Palk Bay)	Mandapam (Gulf of Mannar)	Krusadai Island	Pulli Island	Manauli and New Islands	Hare Island	Andaman Islands
47.	*M. edwardsi Bernard	-	-	-	x	-	-	-	-	-	-
48.	*M. verrucosa (Lamarck)	-	-	-	-	-	-	-	x	-	-
49.	*M. verrilli Vaughan	-	-	-	x	x	x	-	x	x	-
50.	*M. informis Bernard	-	-	-	x	x	x	-	x	x	-
51.	*M. composita Crossland	-	-	-	x	-	-	-	-	-	-
52.	M. foliosa (Pallas)	-	-	-	x	x	x	x	x	x	x
	Genus Pavona										
53.	*P. explanulata Lamarck	-	-	-	-	-	-	-	-	-	x
54.	P. maldivensis (Gardiner)	-	-	x	-	-	-	-	x	-	-
55.	P. varians (Verrill)	x	x	-	x	-	x	-	-	-	-
56.	*P. decussata (Dana)	-	-	-	-	-	-	-	x	-	-
	Subgenus Polyastra										
57.	*P. (Polyastra) venosa Ehrenberg	-	-	-	-	-	x	-	-	-	-
	Genus Pachyseris										
58.	*P. rugosa (Lamarck)	-	-	-	-	-	-	-	x	-	-
	Genus Siderastrea										
59.	*S. radians (Pallas)	-	-	-	x	x	-	x	-	-	-
60.	*S. savignyana Milne Edwards and Haime	-	-	-	x	-	-	-	x	x	x
	Genus Coscinaraea										
61.	*C. monile (Forskål)	-	-	-	x	-	x	-	x	x	-

Table I (contd.)

S.No.	Name of the species	Localities									
		Laccadives			Mandapam area						
		Chetlat Island	Minicoy	Tuticorin	Mandapam (Palk Bay)	Mandapam (Gulf of Mannar)	Krusadai Island	Pulli Island	Manauli and New Islands	Hare Island	Andaman Islands
	Genus Cycloseris										
62.	*C. cyclolites (Lamarck)	-	-	x	-	-	-	-	-	-	-
	Genus Fungia										
63.	F. echinata (Pallas)	-	-	-	-	-	-	-	-	-	x
64.	F. scutaria Lamarck	x	x	-	-	-	-	-	-	-	-
65.	F. fungites (Linnaeus)	x	x	-	-	-	-	-	-	-	x
66.	F. horrida Dana	-	-	-	-	-	-	-	-	-	x
	Genus Podabacia										
67.	P. crustacea (Pallas)	-	x	-	-	-	-	-	-	-	-
	Genus Goniopora										
68.	*G. stokesi Milne Edwards and Haime	-	-	-	x	-	-	-	-	-	-
69.	*G. djiiboutiensis Vaughan	-	-	-	-	-	-	-	x	-	-
70.	*G. duofaciata Thiel	-	-	-	x	-	x	-	x	x	-
71.	*G. nigra new name	-	-	-	x	-	-	-	x	x	-
	Genus Porites										
72.	*P. solida (Forskål)	-	-	x	x	-	-	x	x	x	x
73.	*P. fragosa Dana	-	-	-	-	-	-	-	x	-	-
74.	P. mannarensis new name	-	-	-	-	-	-	x	x	x	-
75.	P. lutea Milne Edwards and Haime	-	-	-	x	-	-	-	x	-	-

Table I (contd.)

S.No.	Name of the species	Localities: Laccadives: Chetlat Island	Minicoy	Tuticorin	Mandapam area: Mandapam (Palk Bay)	Mandapam (Gulf of Mannar)	Krusadai Island	Pulli Island	Manauli and New Islands	Hare Island	Andaman Islands
76.	*P. somaliensis Gravier	-	-	x	x	x	-	-	x	x	-
77.	*P. lichen Dana	-	-	-	x	-	-	-	x	x	-
78.	P. exserta new name	-	-	-	-	-	-	-	x	-	-
79.	*P. compressa Dana	-	-	-	x	-	x	-	-	-	-
80.	*P. adrewsi Vaughan	-	x	-	-	-	-	-	-	-	-
81.	*P. jonesi new species	-	x	-	-	-	-	-	-	-	-
	Genus Favia										
82.	F. stelligera (Dana)	-	-	-	-	-	-	-	x	-	-
83.	F. favus (Forskål)	-	-	-	x	-	-	-	-	-	-
84.	F. speciosa (Dana)	-	-	-	-	-	-	-	x	-	-
85.	F. pallida (Dana)	x	-	-	x	x	x	x	x	x	x
86.	F. valenciennesii (Milne Edwards and Haime)	-	-	-	x	-	x	x	-	-	x
	Genus Favites										
87.	F. abdiata (Ellis and Solander)	-	x	-	x	-	x	x	x	x	-
88.	*F. virens (Dana)	-	-	-	x	-	-	-	-	-	-
89.	F. halicora (Ehrenberg)	-	-	-	x	-	-	-	-	-	-
90.	F. pentagona (Esper)	-	-	-	-	-	-	-	x	-	-
91.	F. melicerum (Ehrenberg)	-	-	-	-	x	-	-	-	-	-

Table I (contd.)

S.No.	Name of the species	Localities									
		Laccadives			Mandapam area						Andaman Islands
		Chetlat Is.	Minicoy	Tuticorin	Mandapam (Palk Bay)	Mandapam (Gulf of Mannar)	Krusadai Is.	Pulli Island	Manauli and New Islands	Hare Island	
	Genus Goniastrea										
92.	G. retiformis (Lamarck)	-	-	-	x	x	x	x	x	x	-
93.	G. incrustans Duncan	-	-	-	-	-	-	-	x	-	-
94.	*G. pectinata (Ehrenberg)	-	-	x	x	x	x	x	x	x	x
	Genus Platygyra										
95.	P. lamellina (Ehrenberg)	x	-	-	x	x	x	-	x	x	x
	Genus Leptoria										
96.	*L. phrygia (Ellis and Solander)	-	-	-	-	-	x	-	-	-	-
	Genus Hydnophora										
97.	H. exesa (Pallas)	-	-	-	x	-	x	-	-	-	-
98.	H. microconos (Lamarck)	x	-	-	x	-	-	-	x	-	-
99.	*H. grandis Gardiner	-	-	-	x	-	-	-	-	-	-
	Genus Leptastrea										
100.	L. purpurea (Dana)	-	-	-	x	-	x	-	x	-	-
101.	L. transversa Klunzinger	-	-	-	x	x	x	x	x	x	-
	Genus Oulastrea										
102.	*O. crispata (Lamarck)	-	-	-	-	-	-	-	-	-	x
	Genus Cyphastrea										
103.	C. serailia (Forskål)	-	-	-	x	-	x	-	x	-	-
104.	C. chalcidicum (Forskål)	-	-	-	x	-	-	-	-	-	-
105.	C. microphthalma (Lamarck)	-	-	-	x	-	-	-	-	-	-

Table I (contd.)

S.No.	Name of the species	Localities: Laccadives: Chetlat Island	Laccadives: Minicoy	Laccadives: Tuticorin	Mandapam area: Mandapam (Palk Bay)	Mandapam area: Mandapam (Gulf of Mannar)	Mandapam area: Krusadai Island	Mandapam area: Pulli Island	Mandapam area: Manauli and New Islands	Mandapam area: Hare Island	Andaman Islands
	Genus Echinopora										
106.	E. lamellosa (Esper)	-	-	-	-	-	x	-	x	x	-
107.	*E. gemmacea (Lamarck)	-	-	-	-	-	x	-	-	-	-
	Genus Culicia										
108.	C. rubeola (Quoy and Gaimard)	-	-	-	-	-	x	-	x	x	-
	Genus Galaxea										
109.	G. fascicularis (Linnaeus)	x	-	-	x	-	x	-	-	-	-
110.	G. clavus (Dana)	-	-	-	x	-	-	-	-	-	x
	Genus Merulina										
111.	M. ampliata (Ellis and Solander)	-	-	-	x	-	x	-	x	x	-
	Genus Symphyllia										
112.	S. recta (Dana)	-	-	-	x	-	x	-	x	x	x
113.	S. radians (Milne Edwards and Haime)	-	-	-	x	-	-	-	-	-	-
	Genus Mycedium										
114.	*M. tubifex (Dana)	-	-	-	x	-	-	-	-	-	-
	Genus Trochocyathus										
115.	T. sp.	-	-	-	-	x	-	-	x	x	-
	Genus Paracyathus										
116.	*P. parvulus Gardiner	-	-	x	-	-	-	-	x	x	-

Table I (contd.)

S.No.	Name of the species	Localities									
		Lacc a-dives			Mandapam area						
		Chetlat Island	Minicoy	Tuticorin	Mandapam (Palk Bay)	Mandapam (Gulf of Mannar)	Krusadai Island	Pulli Island	Manauli and New Islands	Hare Island	Andaman Islands
	Genus Euphyllia										
117.	E. glabrescens (Chamisso and Esynhardt)	x	x	-	-	-	-	-	-	-	-
	Genus Endopsammia										
118.	*E. philippinensis Milne Edwards and Haime	-	-	-	-	-	-	-	x	-	-
	Genus Dendrophyllia										
119.	D. aurea (Quoy and Gaimard)	-	-	-	-	-	-	-	x	x	-
120.	D. robusta (Bourne)	-	-	-	-	-	-	-	x	-	-
121.	*D. indica sp. nov.	-	-	x	-	-	-	-	-	-	-
	Genus Turbinaria										
122.	T. crater (Pallas)	-	-	-	-	-	x	-	-	-	-
123.	*T. quincuncialis Ortmann	-	-	x	-	-	-	-	-	-	-
124.	T. peltata (Esper)	-	-	-	x	x	-	-	-	-	-
125.	*T. mesenterina (Lamarck)	-	-	-	-	-	-	-	x	-	-

Phylum COELENTERATA Frey and Leukart, 1847

Subphylum CNIDARIA Hatschek, 1888

Class ANTHOZOA Ehrenberg, 1834

Subclass ZOANTHARIA de Blainville, 1830

Order SCLERACTINIA Bourne, 1900

The Scleractinia or stony corals, comprises exclusively of marine, solitary or colonial zoantharians with calcareous skeleton secreted by the epidermal calicoblast cells. The order scleractinia is divided into five suborders (Vaughan and Wells, 1943); distinguished as follows.

Synopsis of the characters of suborders of scleractinia

I. Mainly colonial, rarely solitary. Corallites small usually 1 to 3 mm. in diameter; septa laminar, rudimentary, composed of relatively few (6 to 8) simple or compound trabeculae; edges of septa entire or minutely dentate.

-- Astrocoeniina

II. Solitary or colonial with corallites generally larger than in I; septa well developed, basically laminar or fenestrate, composed of numerous simple or compound trabeculae.

A. Synapticulae present.

(i) Corallum free or fixed; septa basically fenestrate, more or less porous with beaded or dentate edges.

-- Fungiina

(ii) Septa basically laminar, irregularly perforate, septal margin entire or irregularly and minutely beaded. -- Dendrophyllina

B. Synapticulae generally absent.

(i) Septa basically laminar solid, margin with small or well developed dentition -- Faviina

(ii) Mainly ahermatypic, with laminar septa. Septal edges generally smooth. -- Caryophyllina

Suborder ASTROCOENIINA Vaughan and Wells, 1943.

Key to the families of the suborder Astrocoeniina considered herein.

I. Coenosteum very little differentiated. Septa confluent from calyx to calyx. A well defined thecal wall absent. -- Thamnasteriidae

II. Coenosteum and corallite wall better differentiated.

(i) Coenosteum non-porous - dense -- Pocilloporidae

(ii) Coenosteum porous. -- Acroporidae

Family THAMNASTERIIDAE Vaughan and Wells, 1943.

Characters of the family:

Hermatypic, colonial, incrusting, massive or ramose corals without well defined thecal wall. Septa small, confluent between calices, more or less porous with beaded edges and spinulose sides. Columella sometimes absent; if present styliform.

The genus Psammocora is the only living member of this family.

Genus PSAMMOCORA Dana, 1846.

Psammocora Dana, 1846, p.35.

Genotype - Pavona obtusangula Lamarck, 1816.

Generic characters:

Corallum encrusting, massive, foliaceous or ramose. Calices small, not bounded by a well defined thecal wall, several of them often being enclosed by a rounded colline. Septa ramifying, confluent with the surrounding coenenchyme. Columella a small tubercle.

Atleast, three species of this genus are known from the seas around India. Gardiner (1905) has recorded P. contigua (Esper) and P. haimiana (Milne Edwards and Haime) from Minicoy. Subsequently Matthai (1924) has doubtfully referred a specimen from Andamans to P. profundacella Gardiner. Later Gravely (1927) has also recorded P. contigua from the littoral waters of Krusadai Island. The present collection includes a single species of this genus and it is described below.

Psammocora contigua (Esper), 1797.

(Pl. II, fig. 1)

Madrepora contigua Esper, 1797, p.81, pl.66.

Psammocora contigua Gardiner, 1905, p.951.

Horst, 1921, p.33.

Horst, 1922, p.425.

Hoffmeister, 1925, p.45, pl.5, figs. 1a, 1b, 2a, 2b.

Yabe, Sugiyama and Eguchi, 1936, p.59, pl.44, figs. 5, 6, 8; pl.45, figs.2, 3, 6.

Matthai, 1948a, p.187, pl.10, figs.41 to 43.

Crossland, 1952, p.165, pl.15, figs.4, 5; pl.17, fig. 3.

Nemenzo, 1955, p.23, pl.5, figs. 1, 3; pl.6, fig. 4.

Stephenson and Wells, 1956, p.10.

Description of a specimen from Krusadai Island:

Colony about 50 cm. in greater spread, part of which is dead and overgrown by the alga Caulerpa peltata. Branches 8 to 9 cm. in heights with their lower parts dead; the living zones being confined to the upper 4 to 5 cm. Tip of branches flattened, 2 to 2.5 cm. in width, 3 to 4 mm. thick; coalascent, often with a few "crooked rod like branchlets".

Calices, small about a mm. in diameter when measured between the outer edges of the larger septa; flush with the surface and are arranged in longitudinal rows almost parallel to the long axis of the branches. 6 to 8 septa can be counted around an axial fossa, out of which 3 or 4 are larger and petaloid. The smaller and thinner alternating ones, ramify at their outer edges to merge with the surrounding coenenchyme. Edges of septa serrated, sides granulose. Axial fossa small, 0.2 to 0.25 mm. in diameter, each with a central rod-like or compressed columella.

Surface coenenchyme composed of a fine net-work of lamellae, the meshes of which are filled with finely frosted rods.

Another specimen obtained from Chetlat Island, has stouter branches and comparatively larger calices, with upto ten septa in some calices. This specimen resembles the one which Mayer (1918) has figured in his Plate 18, figure 43, under the name P. gonagra Klunzinger, which according to Stephenson and Wells (1956) is identical with the present species.

A third small colony, which was apparently lying free without any sign of an earlier attachment, collected from Minicoy, agrees in its calicular characters to the Krusadai Specimen, already described.

Localities:

Krusadai Island, Minicoy, Chetlat Island.

Distribution:

Red Sea; Mauritius; Maldives; Laccadives; Krusadai; Singapore (Purchon, 1956); Philippines; East Indies; Palau Island; Low Iâles; Marshall Islands; Samoa and Tahiti.

Family POCILLOPORIDAE Gray, 1842.

Characters of the family:

Hermatypic, colonial, plocoid, or ramose stony corals with a solid coenosteum. Corallites generally small, 1 to 2 mm. or so in diameter, with two cycles of small, spiny septa. Columella when present styliform or absent. Asexual reproduction by extra tentacular budding.

Key to the genera of the family Pocilloporidae considered herein.

I. Septa and columella well developed. Coenenchyme rises above the calyx as hoods. -- Stylophora Schweigger.

II. Septa and columella poorly developed. Verrucae present. -- Pocillopora Lamarck.

Genus STYLOPHORA Schweigger, 1819.

Stylophora Schweigger. Duncan, 1885, p.45.

Genotype - Madrepora pistilata Esper, 1797.

Generic characters:

Corallum ramose or submassive, calices small, septa and columella well developed; the primary cycle reaching the columella. Coenenchyme rises above the level of the calyx as hood. Corallites irregularly disposed over the branches.

This genus differs from the closely related Seriatopora by its irregular disposition of corallites, against the serial longitudinal arrangement of the latter.

There is no previous record of this genus from the seas of India. The collection includes a single species as identified below.

Stylophora mordax (Dana), 1846.

(Pl. II, fig. 3)

Sideropora mordax Dana, 1846, p.518, pl.49, figs. 1, 1a, 1b.

Stylophora mordax Vaughan, 1918, p.81, pl.25, figs. 1, 1a, 2,2a,2b.

Yabe, Sugiyama and Eguchi, 1936, p.15, pl.3, fig.2.

Eguchi, 1938, p.334.

Umbgrove, 1939, p.23.

Wells, 1954, p.411, pl.96, fig. 5

Description:

Corallum cespitose, 9.5 cm. in greater diameter, with a height of 5.5 cm. Branches comparatively narrow at their base, 6 to 12 mm. thick, expanded above. The broadest branch at its top measures 41 mm. Corallites neatly rounded or oval in outline, rather deep and irregularly distributed. Calices 0.85 to 1 mm. in diameter, average 0.9 mm.; close together, with occasional giant calices with double the number of usual septa. Septa twelve in number, not exsert; primaries larger and thicker, extending to the columella. Septal edges entire or rarely with two or three minute serrations. Inter-septal loculi wide, oval in shape when viewed from above. Columella a single, pointed, upright style.

The coenenchyme around the upper one third to half of the calyx rises above the calyx, almost in the form of half-a-canoe. Coenosteum non-porous, solid, with spinulose surface.

Colour:

Washed and dried corallum yellowish brown.

Locality:

The single specimen in the present collection is obtained from Chetlat Island.

Distribution:

Red Sea (Crossland, 1931); Tanganyika (Talbot, 1965); Chetlat Island; Singapore (Purchon, 1956); Bay of Batavia; Diato-zima; Fiji; Palau Island; Caroline Island; Fanning Island; Marshall Islands, Maldives (Wells and Davies, 1966).

Genus POCILLOPORA Lamarck, 1816.

Pocillopora Lamarck, 1816, p.273.

Genotype - Pocillopora acuta Lamarck, 1816.

Generic characters:

Corallum ramose, rarely massive or encrusting; calices small, septa and columella poorly developed, sometimes absent. The coenenchyme rises everywhere as short protuberances termed verrucae. Coenosteum solid.

The previous records of this genus from this part of the Indian ocean are only few. Ridley's (1883) account of the coral fauna of Ceylon includes among others, three species of Pocillopora viz. P. grandis Dana, P. brevicornis Lamarck and P. elongata Dana. Gardiner (1897) has referred P. elongata Dana to the synonymy of P. grandis alongwith P. elegans Dana and P. eydouxi Milne Edwards and Haime. But Vaughan (1907) has suggested that P. elongata and P. eydouxi are probably one and the same and he (Vaughan, 1918) kept P. grandis and P. elegans as distinct. Gravely (1927) has recorded P. damicornis Linnaeus from Krusadai Island.

The present collection includes five species of this genus as considered below.

Synopsis of the characters of the species of Pocillopora described in this work.

A. Septa and columella rudimentary.

(i) Corallum cespitose, branches lax; about a centimeter or so in basal diameters. Terminal verrucae well developed. -- Pocillopora damicornis (Linnaeus)

(ii) Colony bushy with thicker and broader branches than in (i). Branches terete in outline; verrucae slender at the top of branches, dome-shaped below. -- P. danae Verrill

(iii) Branches low, about 5 cm. or less in height; broad at the top. Verrucae numerous, small. -- P. brevicornis Lamarck.

(iv) Corallum tall, branches flat and broad, with well developed uniform sized verrucae all over. -- P. verrucosa (Ellis and Solander)

B. Septa and columella comparatively better developed.

(v) Corallum composed of large palmate clumps. Verrucae well developed. Coenenchymal ornamentation compressed tangentially. -- P. eydouxi (Milne Edwards and Haime).

Pocillopora damicornis (Linnaeus), 1758.

(Pl. II, figs. 4, 5)

Pocillopora damicornis Hoffmeister, 1925, p. 15, pl. 1, fig. 1.
Stephenson, 1931, pl. 6, figs. 1 to 9.
Thiel, 1932, p. 26, pl. 2, fig. 2.
Yabe, Sugiyama and Eguchi, 1936, p. 12, pl. 4, figs. 3 to 5; pl. 5, figs. 3, 4; pl. 7, figs. 2, 5.

Umbgrove, 1939, p.21.

Crossland, 1948, p.183.

Wells, 1950, p.34.

Crossland, 1952, p.110.

Durham and Bernard, 1952, p.20, pl.1, figs. 3a, 3b, 3c.

Wells, 1954, p.412, pl.99, fig. 2.

Stephenson and Wells, 1956, p.11.

Nemenzo, 1964, p.212, pl.8, fig. 2; pl.9, figs. 1, 2.

Several specimens belonging to this species were examined. A generalised description of which follows.

Description:

Colonies cespitose, subhemispherical, generally 10 to 15 cm. in greater diameter. Larger colonies upto 30 cm. in top diameter and 20 cm. in height are common at Krusadai Island. The lower parts of such larger colonies were found to be dead and buried under the sand; with the living zone extending from 7 to 10 cm. from top to bottom. Branches about a cm. in basal diameter; irregular in outline, and are laxly dividing. Top of branches a bit broadened or more profusely subdividing with well developed verrucae; or coarse and straggling with lesser developed verrucae. Verrucae acute, obtuse or flattened from side to side; generally 3 to 5 mm. in thickness and 3 to 6 mm. in height.

Calices on the top of branches 1 to 1.2 mm. in greater diameter, angular, much crowded with very little coenenchyme inbetween. At the basal part of the branches they are circular

or oval in outline, 0.5 to 1 mm. in diameter; 0.35 to 0.5 mm. apart, rarely upto 1 mm. Septa and columella as a rule not well developed, though in some older calices a few septa can be recognized. The calicular bottom is smooth, or with minute granulations in older calices.

The coenenchymal ornamentation is made up of small spines; the adjacent ones being 0.15 to 0.2 mm. apart. Their apices are blunt or generally pointed. In some cases 2 or 3 of them may fuse basally, but their apices remain free.

A specimen obtained from Andamans (pl.II, fig. 4) is peculiar in its growthform and warrants a few separate remarks.

The branches in this specimen instead of growing vertically as usual, are horizontal and arranged in the form of a rosette. The colony has a greater diameter of about 14 cm. with a total thickness of 5 cm. at its central part. Verrucae at the central part of the corallum are small, 1 to 2 mm. in size; but they become larger towards the periphery of the colony. This horizontal growth of the colony was probably caused by the shallowness of the region from where it was collected.

Localities:

Krusadai Island, Pulli Island, Manauli Island, Hare Island, Mandapam (both Palk Bay and Gulf of Mannar), Chetlat Island, Minicoy, Tuticorin and Andaman Islands.

Distribution:

Red Sea and Natal coast (Crossland, 1948); Mauritius; Laccadives; Gulf of Mannar and Palk Bay around Mandapam; Tuticorin; Maldives (Wells and Davies, 1966).

Madras coast (Gravely, 1941); Andamans; Cocos-Keeling Islands; Low Isles; Murray Island; Fiji; Manga Rava Paumotus (Vaughan, 1906); Palau Islands; Fanning Island ; Samoa; Hawaii; Tahiti; Galapagos Island; Panama.

Remarks:

It is the commonest species of the genus around Mandapam. The present collection includes specimens referrable to typical damicornis and its two varieties namely bulbosa and cespitosa as recognized by Hoffmeister (1925). Majority of the colonies found in the lagoons of the various Islands in the Gulf of Mannar are referrable to variety bulbosa. Three specimens obtained from the top of a rock at Manauli, belong to typical damicornis. A few specimens collected from the outer side of the granite wall of the dock-yard at Mandapam, and from the outer side of the reefs at Palk Bay tally with published figures of the variety cespitosa.

Pocillopora danae Verrill, 1864

(Pl.III, fig. 1)

Pocillopora danae Verrill, 1864, p.50.
Vaughan, 1918, p.77, pl.22, figs. 1, 1a, 2.
Thiel, 1932, p.27, pl.1, fig. 7.
Crossland, 1952, p.110.
Wells, 1954, p.412.
Nemenzo, 1964, p.210, pl.7, fig. 1.

Three bushy, profusely branching coralla with measurements as tabulated below are referred to this species.

No.	Diameter of the main stem at the broken end in cm.	Total height of the colony in cm.	Greater diameter at the top in cm.	Depth of living zone in cm.
1.	2.5 x 4	2 8	16 x 18	10
2.	2 x 2	36	29 x 20	12
3.	2 x 2	18	12 x 10	10

Description:

The main stem breaks up into stout arborescent branches, all of which subdivide to give rise to several branchlets. Branchlets flat and expanded at the top or they may be slightly tapering. Top of branchlets 15 to 20 mm. in width, in some cases they are narrower and pointed. Distance between top to top of branchlets vary from 15 to 20 mm. Verrucae well developed. In some branchlets the growing tip is devoid of verrucae. Verrucae on the upper part of the branchlets 3 to 6 mm. thick, 2 to 6 mm. in height. On the basal part of the branches they are rounded and dome-shaped.

Calices on the top of branchlets and verrucae, polygonal, excavated, 1.2 to 1.5 mm. in diameter, much crowded with very little inter-corallite region. On the basal part of branches calices are rounded or oval, with an average diameter of 0.75 mm. A few rudimentary septa can be recognized in some of the older calices. Columella not seen. Bottom of the calyx smooth or granular. Coenosteum wherever well differentiated is provided with small granulations; about 16 around a calyx.

Colour:

Living coral yellowish brown.

Locality:

Manauli Island. Depth about a meter at low tide. Bottom filled with dead branches of Acropora. Dead and broken pieces of this corals are found washed ashore at Shingle Island. A small specimen obtained from Minicoy also appears to be referrable to the present species.

Distribution:

Mauritius (Crossland, 1952); Minicoy; Manauli Island; Shingle Island; Banda Sea; Philippines; Great Barrier Reef; Fiji; Marshall Islands; Tahiti.

Pocillopora brevicornis Lamarck, 1816.

(Pl. II, fig. 2).

Pocillopora brevicornis Lamarck, 1816, p.443.
Ridley, 1883, p.260.
Hoffmeister, 1925, p.17, pl.1, fig. 2.
Wells, 1954, p.413, pl.98, figs. 1, 2.
Nemenzo, 1964, p.211, pl.7, fig. 2.

Description:

Corallum 13 cm. in diameter; low, with numerous, small stunted, crowded branches 1.5 to 2.5 cm. in height. Top of branches flattened, the broadest 3.5 cm. wide; others less, with a thickness of 8 to 10 mm. including the verrucae. Verrucae small, lateral ones average 2 mm. in width and 2 to 4 mm. in height. Distance between adjacent ones 3 to 4 mm.

Calices on the growing edges and on the verrucae, polygonal, shallow, 0.8 to 0.9 mm. in length; rounded and smaller towards the base of branches. A few small spiny septa can be

recognized in some of the older calices. Columella absent. Bottom of the calyx smooth or granular.

Coenenchymal ornamentation consists of evenly distributed spinules, the number of rows of spinules depending on the width of the intercorallite regions.

Locality:

The single specimen in the present collection is obtained from Andamans (Port Blair).

Distribution:

Ceylon; Andamans; East Indies; Philippines; Fiji; Hawaii; Marshall Islands and Samoa.

Pocillopora verrucosa (Ellis and Solander), 1786.
(Pl. III, fig. 2)

Pocillopora verrucosa Vaughan, 1918, p.77, pl.23, figs.1, 2, 2a.
Yabe, Sugiyama and Eguchi, 1936, p.14, pl.3, figs. 3, 4.
Umbgrove, 1939, p.22.
Wells, 1915, p.34, pl.9, fig. 2.
Crossland, 1952, p.111.
Wells, 1954, p.413, pl.98, figs. 5, 6.
Stephenson and Wells, 1956, p.12.
Nemenzo, 1964, p.209.

Description:

Two specimens of this species, one a small entire colony 15 x 10 cm. in top diameters and 9 cm. in height and another a broken clump from an arborescent colony are present in the collection.

Branches compressed at their top, 20 to 42 cm. in width and 10 to 12 mm. in thickness including the verrucae. A few are narrow and rounded in outline. Verrucae prominent, well developed all over the branches. Lateral verrucae about 3 mm. in thickness, 3 to 6 mm. in height. Certain branches lack well developed terminal verrucae. Distance from top to top of verrucae 4 to 5 mm.

Calices on verrucae and apex of branches, polygonal, about a mm. in length, crowded, moderately deep. At the basal parts of the branches they are rounded, smaller and shallower. In older calices septa in the form of small spines. A columella is wanting. Intercorallite areas supplied with small, sharp spines.

Locality:

Andaman Islands (Port Blair).

Distribution:

Red Sea; Tanganyika (Talbot, 1965); Andaman Islands; Singapore (Purchon, 1956); Cocos-Keeling Islands; Formosa (Taiwan) (Kawaguti, 1953); Low Isles; Palau Islands; Caroline Islands; Fiji; Marshall Islands; Hawaii.

Pocillopora eydouxi Milne Edwards and Haime, 1860.

(Pl. III, fig. 3)

Pocillopora eydouxi Vaughan, 1918, p.79, pl.24, figs. 1, 2, 2a.
Yabe, Sugiyama and Eguchi, 1936, p.13, pl.2, fig. 5; pl.4, fig. 2; pl.6, figs. 4, 5; pl.7, figs. 4, 5, 6.

Umbgrove, 1939, p.22.

Crossland, 1952, p.112, pl.1, figs. 1, 2.

Wells, 1954, p.414, pl.98, figs. 3, 4;
pl.99, fig. 1.

Stephenson and Wells, 1956, p.12.

Description:

Corallum composed of numerous stout, palmate branches arising from a broad base. The entire colony measured about 30 cm. in greater spread and so much in height. A branch measures 15 cm. in height including the branchlets. Verrucae present all over the branches; lateral ones 3 to 4 mm. thick 4 to 5 mm. in height; 3 to 5 mm. apart. They are smaller and obsolete towards the basal part of the branches.

Calices over the verrucae large, polygonal, about 1 mm. in length; those of the level region, rounded, 0.5 to 0.9 mm. in diameter, 0.2 to 0.7 mm. apart. Septa and columella comparatively better developed. Generally two cycles of small septa are visible; the two directives being much pronounced and usually extending to the columella. Columella a pointed style, rising half to two-third of the height of the calyx. The coenenchymal ornamentation comprises; as pointed out by Vaughan (1918) "erect, spinules, frequently those medially situated on the intercalicular coenenchyme are tangentially compressed, while often a crown of erect pointed spinules corresponds to the outer ends of the septa".

Locality:

Keelakarai (Gulf of Mannar).

Distribution:

A wide spread Indo-Pacific species. There are numerous records of this species from the Pacific ocean; but records of its occurrence in the Indian Ocean are comparatively few. Talbot (1965) has recently recorded this species from Tanganyika, thus extending its distribution from the eastern coast of Africa eastward to Samoa.

Family ACROPORIDAE Verrill, 1902.

Characters of the family:

Encrusting, massive, ramose, or foliaceous mainly colonial, hermatypic corals, with synopticulothecate or pseudothecate wall. Coenosteum well differentiated, porous or solid, with level or projecting corallites. Septa usually 12, non-exsert, laminar. Columella weakly developed or absent.

The members of this family are very successful and form nearly two-third of the total extant hermatypic corals (Vaughan and Wells, 1943). Out of the 4 known living genera of this family, only two are represented in the present collection.

Key to the genera of the family Acroporidae considered herein.

I. Corallites both projecting and immersed, an axial corallite always present. -- Acropora Oken

II. Corallites non-projecting. An axial corallite absent. -- Montipora Quoy and Gaimard

Genus ACROPORA Oken, 1815

Acropora Oken, 181 5, Lehrb. Naturg. Th. 3, p.66 (cited after Vaughan, 1918).

Vaughan, 1902, p.54.

Maren zeller, 1906, p.30.

Vaughan, 1918, p.159.

Madrepora Brook, 1893, p.21 (Synonymy).

Isopora Vaughan, 1901, p.312.

Genotype Millepora muricata Linnaeus, 1758

Generic characters:

Corallum ramose, rarely massive or incrusting. Axial corallite projecting which buds off the radial corallites. Radial corallites both immersed and protuberant. Septa in two cycles. Coenostum reticulate, echinulate or flaky. Porous or dense. A well defined columella absent.

Previous records of this taxonomically difficult genus from the coastal waters of India are very few, though there are several records of this genus from Ceylon. Brook (1893) has reported the presence of 8 species of Acropora from Rameswaram. Later Gravely (1927) noticed the presence of Acropora cervicornis (Lamarck), A. spicifera (Dana) and A. erythraea (Klunzinger) among the littoral fauna of Krusadai Island. Sewell (1935) has collected Acropora pharaonis (Milne Edwards and Haime) from Pamban near Mandapam. On the whole 12 species of Acropora are previously known from India excluding Ceylon. A complete list of species of Acropora, so far known from the seas around India and Ceylon is given in Table II.

TABLE II

List of Acropora known from the seas around India including Ceylon. Species are given in alphabetical order. Those marked with an asterisk (*) are not represented in the collection.

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S. No.	Name of the species	Localities
1.	*A. africana (Brook)	Ceylon (Brook, 1893).
2.	*A. cervicornis (Lamarck)	Krusadai Island (Gravely, 1927).
3.	A. ceylonica (Ortmann)	Ceylon (Ortmann, 1889); Manauli Island (present record).
4.	A. corymbosa (Lamarck)	Rameswaram (Brook, 1893); Palk Bay and Gulf of Mannar around Mandapam (present record).
5.	A. digitifera (Dana)	Mandapam (Palk Bay) (present record).
6.	A. diversa (Brook)	Krusadai Island, Hare Island and Andaman Islands (present record).
7.	A. echinata (Dana)	Near Mandapam (present record).
8.	*A. effusa (Dana)	Ceylon (Ortmann, 1889).
9.	*A. elegantula (Ortmann)	Ceylon (Ortmann, 1889).
10.	A. erythraea (Klunzinger)	Gulf of Mannar around Mandapam (Gravely, 1927) also the present record.
11.	A. sp. cf. exigua (Dana)	Mandapam Palk Bay (present record).
12.	A. formosa (Dana)	Ceylon (Ortmann, 1889); Palk Bay and Gulf of Mannar around Mandapam (present record).
13.	A. haimei (Milne Edwards and Haime)	Ceylon (Brook, 1893); Mandapam (Palk Bay), Chetlat Island (present record).
14.	A. hebes (Dana)	Andaman Islands (present record).
15.	A. hemprichi (Ehrenberg)	Ceylon (Ortmann, 1889).

Table II (contd.)

S. No.	Name of the species	Localities
16.	A. humilis (Dana)	Ceylon (Ortmann, 1889); Palk Bay and Gulf of Mannar around Mandapam, Andaman Islands (present record).
17.	A. hyacinthus (Dana)	Ceylon (Ridley, 1883); Mandapam (Palk Bay) and Andaman Islands (present record).
18.	A. indica (Brook)	Rameswaram (Brook, 1893); Manauli Island (present record).
19.	A. intermedia (Brook)	Mandapam (Palk Bay), Minicoy (present record).
+20.	*A. microphthalma Verrill	Rameswaram (Brook, 1893).
21.	*A. millepora (Ehrenberg)	Ceylon (Brook, 1893).
22.	A. multicaulis (Brook)	Rameswaram (Brook, 1893); Manauli and Pulli Islands (present record).
23.	*A. multiformis (Ortmann)	Ceylon and Rameswaram (Brook, 1893).
24.	A. nobilis (Dana)	Ceylon (Ortmann, 1889); Hare Island and Manauli Island (present record).
25.	A. obscura (Brook)	Rameswaram (Brook, 1893); Mandapam (Palk Bay) (present record).
26.	*A. orbicularis (Brook)	Ceylon (Brook, 1893).
27.	A. pharaonis (Milne Edwards and H aime)	Pamban (Sewell, 1935) also the present record.
28.	*A. plantaginea (Lamarck)	Ceylon (Brook, 1893).
29.	A. polymorpha (Brook)	Mandapam (Palk Bay) (present record).
30.	A. procumbens (Brook)	Andaman Islands (present record).
31.	*A. secale (Studer)	Ceylon (Brook, 1893).
32.	A. sp.	Mandapam (Palk Bay) (present record).

+ According to Stephenson and Wells (1956) the specimens described by Brook under this name from Rameswaram do not belong to Verrill's species.

Table II (contd.)

S. No.	Name of the species	Localities
33.	*A. selago (Studer)	Ceylon (Ortmann, 1889).
34.	*A. seriata (Ehrenberg)	Ceylon (Brook, 1893).
35.	A. spicifera (Dana)	Krusadai Island (Gravely, 1927); also the present record.
36.	A. squamosa (Brook)	Mandapam (Palk Bay) (present record).
37.	A. surculosa (Dana)	Rameswaram (Brook, 1893); Mandapam (Gulf of Mannar) (present record).
38.	A. syringodes (Brook)	Andaman Islands (present record).
39.	A. thurstoni (Brook)	Rameswaram (Brook, 1893); Mandapam (Palk Bay) (present record).
40.	A. valenciennesi (Milne Edwards and Haime)	Ceylon (Ortmann, 1889).
41.	A. variabilis (Klunzinger)	Ceylon (Brook, 1893); Andaman Islands (present record).

Several of the species recorded from Ceylon are not found on the reefs around Mandapam. 27 species of Acropora are described in detail in this work, out of which one could not be identified satisfactorily. None of the species is new to science. Four species, namely A. hebes, A. variabilis, A. syringodes and A. procumbens are obtained only from Andamans. The rest of the species were collected around Mandapam. A list of the species described herein, with their local distribution and abundance is presented in Table III.

TABLE III

List of Acropora described in this work. Species are listed in the order of their treatment in the text.

S. No.	Name of the species	Localities and abundance					
		Mandapam (Palk Bay)	Krusadai Island	Pulli Island.	Manaali and New Islands.	Hare Island.	Andamans
1.	A. intermedia (Brook)	x	-	-	-	-	-
2.	A. formosa (Dana)	xx	-	-	xx	x	x
3.	A. haimei (Milne Edwards and Haime)	xx	-	-	-	-	-
4.	A. nobilis (Dana)	-	-	-	x	xxx	x
5.	A. pharaonis (Milne Edwards and Haime)	x	-	-	-	-	-
6.	A. multicaulis (Brook)	-	-	x	x	-	-
7.	A. thurstoni (Brook)	x	-	-	-	-	-
8.	A. obscura (Brook)	x	-	-	-	-	-
9.	A. sp.	x	-	-	-	-	-
10.	A. corymbosa (Lamarck)	xxx	-	x	x	x	-
11.	A. hyacinthus (Dana)	xx	-	-	-	-	x
12.	A. surculosa (Dana)	-	-	-	xxx	xx	-
13.	A. spicifera (Dana)	-	x	-	-	-	-
14.	A. indica (Brook)	-	-	-	x	-	-
15.	A. squamosa (Brook)	xx	-	-	-	-	-
16.	A. hebes (Dana)	-	-	-	-	-	x

Table III (contd.)

S. No.	Name of the species	Localities and abundance					
		Mandapam (Palk Bay)	Krusadai Island.	Palli Island.	Manauli and New Islands.	Hare Island.	Andamans
17.	A. sp. cf. exigua (Dana)	x	-	-	-	-	-
18.	A. humilis (Dana)	x	x	-	x	x	x
19.	A. diversa (Brook)	-	x	-	-	x	x
20.	A. digitifera (Dana)	x	-	-	-	-	-
21.	A. erythraea (Klunzinger)	-	x	x	xx	xx	-
22.	A. variabilis (Klunzinger)	-	-	-	-	-	x
23.	A. ceylonica (Ortmann)	-	-	-	x	-	-
24.	A. polymorpha (Brook)	x	-	-	-	-	-
25.	A. syringodes (Brook)	-	-	-	-	-	x
26.	A. echinata (Dana)						-
27.	A. procumbens (Brook)	-	-	-	-	-	x

x = present.

xx = fairly common.

xxx = abundant.

Acropora intermedia (Brook), 1893.

(Pl. III, fig. 5).

Madrepora intermedia Brook, 1893, p.31, pl.1, fig. c.

Acropora intermedia Crossland, 1952, p.200, pl.32, fig. 1.

Stephenson and Wells, 1956, p.16.

Description:

Corallum arborescent, from a thick dead branch of the same species. Height of corallum 22 cm.; greater spread 23 cm. The main stem at a height of 2 cm. from the point of its origin divides into 10 radiating branches, all of which in their turn subdivide. Ultimate branches 6 to 8 cms. in length, 8 to 10 mm. in basal diameter, with tapering apex.

Axial corallites 2 to 2.5 mm. diameter, about 2 mm. exsert, wall thick and costate. Opening rounded or oval;septa in two cycles, primaries large and almost meeting in the centre of the calyx. Secondaries smaller rarely complete.

Prominent radial corallites tubular, with less developed inner wall and oblique openings. The radials extend at right angles to the long axis of the branches, except at the extreme tip of branches. Brook's (loc. cit.) measurements for the radials of the species also hold good for the present specimen. They are 2.5 to 3 mm. in length at the top of the branches, smaller below to assume the shape of warty prominences at the basal part of branches. A few shorter, nariform and subimmersed corallites are found scattered among the larger ones. Younger radials have only the first cycle of septa; whereas the older ones may posses varying numbers of secondaries, sometimes in full.

Wall of the younger radials porous; rather compact in older ones. Outer wall striated and echinulate. Surface of coenenchyme reticulate with scattered echinulations; moderately porous in section.

Colour:

Living coral brown with white tips.

Localities:

Dead and broken branches of this species are found in plenty at the eastern end of the 'Kathuvallimuni reef' at Mandapam (Palk Bay). Living colonies are rare. A small branch from Minicoy also seems to belong to this species.

Distribution:

Tanganyika (Talbot, 1965); Maldives; Minicoy; Mandapam (Palk Bay); Low Isles;

Acropora formosa (Dana), 1846

(Pl.III, fig. 4).

Madrepora formosa Dana, 1846, p.473, pl.31, fig. 2.
Brook, 1893, p.43.

Acropora formosa Hoffmeister, 1925, p.55, pl.8, figs. 1, 2, 2a, 3a, 3b.
Wells, 1950, p.35.
Wells, 1954, p.415, pl.102, figs. 1 to 9; pl.103, figs. 1 to 5; pl.104, fig. 4.
Stephenson and Wells, 1956, p.14.

Acropora nobilis Wells (non Dana), 1954, p.416, pl.104, figs. 1, 2.

Acropora laevis Crossland, 1952, p.230, pl.45, figs. 1, 2.

The following is a generalized description of the species based on a fair suit of specimens collected.

Corallum arborescent, the largest entire colony collected measures 30 cm. in height and 40 cm. in greater spread. Main branches long, 1 to 2 cm. thick at the base, laxly dividing. Top most branches 4 to 7 cm. long, about a cm. thick at the base, apices slightly tapering with 2 to 4 small proliferations.

Axial corallites 2 to 2.5 mm. in diameter, upto 2.5 mm. exsert, wall porous and fragile; opening rounded or oval; primary septa subequal, large; secondary septa scarcely developed, rarely one or two may be recognized.

Radial corallites tubular, slender, crowded and ascending with less developed inner wall. Length of tubular corallites vary from 3 to 4 mm; with a top diameter of 1 to 1.5 mm. Larger radials possess one or two buds at their base. Shorter tubular and immersed cells are found scattered among the prominent ones. Generally only the first cycle of septa is developed in the radials, the directives being the largest.

Wall of the radials porous, outer side striated and echinulate; surface coenenchyme reticulate and echinulate; rather dense in section.

Colour:

Live coral either brown or lilac with pink or purple tips.

Localities:

Mandapam (Palk Bay), Manauli Island, Hare Island, Andaman Islands.

Distribution: Maldives (Wells and Davies, 1966); Tanganyika (Talbot, 1965); Ceylon; Mandapam; Manaili Island; Hare Island; Andaman Islands; Singapore; Cocos-Keeling; Amboina; Sulu Sea; Great Barrier Reef; Marshall Islands and Samoa.

Remarks:

Hoffmeister (1925) has recognized two varieties for this species viz. var. gracilis and var. brachiata. But Wells (1954) prefers to call those specimens with salient radials as forma α and forma β for "those with mostly immersed radials, and $\alpha \rightarrow \beta$ for intergrades". All the present specimens posses salient radials and belong to forma α of Wells.

The species differs from Acropora intermedia (Brook) mainly in its larger and much slender radials which are more ascending than in A. intermedia.

Acropora haimei (Milne Edwards and Haime), 1860.
(Pl. IV, fig. 1).

Madrepora haimei — Brook, 1893, p.77 (Synonymy).

Acropora haimei — Marenzeller, 1906, p.51, pl.16, figs. 45-48.
Vaughan, 1918, p.163, pl.66, figs. 4, 5; pl.70, figs. 3, 3a, 3b.
Crossland, 1952, p.207, pl.32, fig. 1; pl.35, fig. 1.
Stephenson and Wells, 1956, p.14.

A generalized description of the species based on several specimens is as follows.

Corallum cespitose with an encrusting base. Greater diameter of colonies 15 to 20 cm., with a height of 12 to 20 cm. including the base. Main branches 1.5 to 2 cm. thick at the base; subdividing 3 or 4 times to give rise to branchlets 2.5 to 4 cm. in length and 6 to 10 mm. thick; with tapering apices.

Axial corallites 3 to 3.5 mm., diameter, rarely upto 4 mm., about 2 mm. exsert. Wall of the axials thickened; opening rounded, about a mm. in diameter. Septa in two cycles, primaries large, secondaries small but well defined.

Radial corallites unequal, proliferous, non-proliferous and immersed. Proliferous corallites are distributed among the non-proliferous ones at random and are 4 to 5 mm. in length. A few of them sometimes grade towards branchlets. The non-proliferous radials are tubular with the inner wall standing slightly below the level of the outer. They are ascending and in some cases a bit compressed from side to side. They are generally 3 mm. in length and about 2 mm. in diameter at the top. The tubular radials loose their significance at the basal parts of the branches, where majority are immersed. Immersed corallites 1 to 1.25 mm. diameter, 1 to 2 mm. apart. Radial corallites have the first cycle of septa well developed, often with 2 to 3 secondaries.

Wall of the radials striated and porous. Surface coenenchyme costulate, spongy, or echinulate. Somewhat dense in section.

Colour:

Brown with white or blue tips in living condition.

Localities:

The species is fairly common at Mandapam (Palk Bay). But it could not be collected from the Gulf of Mannar side. A single branch from Chetlat Island is also referred here.

Distribution:

Red Sea; Laccadives; Ceylon; Mandapam; Great Barrier Reef; Fiji.

Acropora nobilis (Dana), 1846.

(Pl. IV, figs. 2, 3).

Madrepora nobilis Dana, 1846, p.481, pl. 40, fig. 3.
Verrill, 1864, p.40.
Brook, 1893, p.135.

Acropora nobilis Hoffmeister, 1925, p.59, pl.11, figs. 1, 2.
Thiel, 1932, p.126, pl.20, fig. 2.
(NOT) Wells, 1954, p.416, pl.104, figs. 1, 2.

Description:

Corallum arborescent, forming clumps of stout branches 30 to 35 cm. in height. Main branches may sometimes attain a thickness of 4 cm. but usually they are between 2 to 3 cm. The branches subdivide numerously. Top most branches 4 to 7 cm. in length, 1 to 1. 5 cm. thick with blunt or slightly tapering apices.

Axial corallites large, average 4 mm. in diameter, in some cases they are only 2.5 to 3 mm. They are little exsert, but rarely they project 2 mm. or more. Wall highly thickened, porous, costulate. Aperture rounded or oval; septa 12, primaries subequal, large.

Radial corallites highly variable in size and shape in different colonies and in different branches of the same colony. They are half-tubular, both proliferous and non-proliferous, much crowded with numerous labellate and shorter nariform ones with their openings facing different directions, interspaced. A few subimmersed and immersed corallites are also seen, especially towards the basal part of the branches. Larger tubular corallites 2.5 to 3 mm. in length; 1.5 to 2.5 mm. thick. Shorter and labellate ones 1 to 1.5 mm. in length and diameter. Angle of the radials with the long axis of the branches vary considerably; sometimes they are at right angles. The tubular radial corallites in certain clumps are more uniform in size and shape. Two well developed cycles of septa are present in the radials.

Wall of the young radials moderately porous, getting dense in older ones. Outer side striated with small echinulations at their base. Surface of the coenenchyme reticulate, spongy with scattered echinulation. Corallum moderately dense in section.

Colour:

Brown with white tips in living condition.

Localities:

Manauli Island, Hare Island, Andaman Islands.

Distribution:

Ceylon; Gulf of Mannar around Mandapam; Andaman Islands; Singapore; Java; Banda Sea and Samoa.

Remarks:

Verrill (loc. cit.) refers A. secunda (Dana) as synonym of A. nobilis (Dana). But both Brook (1893) and Hoffmeister (1925) prefer to regard them separate species. According to Hoffmeister (1925) the types of these two species differ as follows: "A. nobilis is much larger, sturdier species with stems many times thicker. In A. nobilis the radial corallites are very unequal in size. Some are large dimidiate, others smaller, labellate, with a thin wall and others immersed. In A. secunda their sizes are much more constant. The axial corallite of the latter may be exsert 3 to 4 mm., whereas in the other species they are in general not so prominent. The radial corallites of A. secunda are more appressed than those of nobilis which often stand perpendicular to the branch. The coenenchyme of the latter is much more spongy - reticulate than that of the former". Study of a large number of specimens during the present investigation, has shown that none of the characters with which Hoffmeister separated A. nobilis and A. secunda are constant in this species. It is noted that certain clumps collected from the central part of very large colonies show comparatively slender branches with uniform sized, appressed, nariform radial corallites resembling the one which Hoffmeister has figured in his Plate II, fig. 2 which is Dana's type of A. secunda; whereas other clumps from the same colony show characters of typical nobilis. Two branches from a single colony is figured in the present work to show the variation. It appears that Verrill is justified in combining these two species, and is followed in this work.

Acropora pharaonis (Milne Edwards and Haime), 1860.

(Pl. XXIV, fig. 6).

Madrepora pharaonis	Brook, 1893, p.58.
	Gravier, 1911, p.73, pl.10, figs. 42, 43.
Acropora pharaonis	Marenzeller, 1906, p.35, pls.4 to 8, figs. 10 to 18; pl.9, figs. 10a to 17a.
Acropora (Rumadrepora) pharaonis	Vaughan, 1918, p.166, pl.69, figs. 1, 2, 3, 3a, 4, 4a, 5; pl.70, figs. 1, 2, 2a.
	Wells, 1950, p.36.

The present collection includes a more or less complete colony and a few branches belonging to this species. The following description is based on the complete corallum.

Description:

Corallum arborescent, somewhat resembling in growthform, the one which Vaughan (1918) has figured in his Plate 69, fig. 1. The main branch originates from a narrow base. The colony has a total height of 20 cm. and a greater spread of 24 cm. Branches subdivide several times to give branchlets 2 to 4 cm. in length and 6 to 10 mm. in thickness.

Axial corallites average 2.5 mm. in diameter; 1.5 mm. exsert. Wall thick and porous; opening rounded. Primary septa large and subequal, secondaries smaller but distinct.

Prominent radial corallites are confined to the upper 2 to 2.5 cm. of the branches below which majority are immersed. Radials are of four kinds, viz. proliferous, non-proliferous, labellate and immersed. Proliferous corallites about 5 mm. in

length, with a rosette of buds at the base and are scattered at random. Non-proliferous corallites tubular 2 to 2.5mm. in length, generally 1.5mm. in diameter; inner wall slightly less developed, outer wall thickned with the plane of aperture perpendicular to the surface of the branches. Labellate ones about 1 mm. in length and width and are found scattered among the tubular ones. The lower part of the branchlets and the main divisions posseas only immersed corallites, though there may be occasional proliferous corallites. Immersed corallites 0.7 to 0.75 mm. diameter. There are generally only 6 septa in radials, but rarely 1 or 2 secondaries may also be present.

Wall of the radial corallites porous with striated outer side. Surface of the coenenchyme striated and echinulate; dense in section.

Colour:

Living coral brown with pale blue axial corallites.

Locality:

Mandapam (Palk Bay).

Distribution:

Red Sea; Somaliland; Madagascar (Pichon, 1964); Mandapam (Palk Bay); Cocos-Keeling Islands.

Acropora multicaulis (Brook), 1893.

(Pl. IV, fig. 4).

Madrepora multicaulis Brook, 1893, p.48, pl.3.

Gravier, 1911, p.68.

Acropora multicaulis Marenzeller, 1906, p.53, pl.17, figs. 54, 55; pl.18, figs. 54a, 55a.

Brook's original description of the species, from Rameswaram is as follows:

"Corallum bushy arborescent, forming broad, much divided clumps 40 cm. wide or more and 23 cm. high. Branches 15 to 18 cm. long and about 1.8 cm. thick at the base, much divided especially near the apex, which is usually divided into 3 to 7 radiating branchlets 1 cm. thick, most of which are again divided and proliferous. Axial corallite 3 to 4.5 mm. diameter, but usually 4 mm. or nearly so, and not much exsert; wall very thick porous. Radial corallites on the distal divisions ascending, dimidiate, the majority subequal, but with a few small between, length 3 mm., diameter 1.5 mm., wall a little thickened but very porous; a variable number, chiefly near the apex, are thicker and bear buds. On the middle sections of the branches the prominent corallites are rather distant, short, thick, nariform, often 2.5 mm., wide, with subimmersed ones scattered between; nearer the base all are small and immersed or subimmersed. Star distinct in the prominent corallites, the directive septa broad; in the immersed corallites the directive septa are scarcely more prominent than the others. Corallum very porous; surface spongy above, evenly reticulate below; wall striato-reticulate and echinulate".

"Indian Ocean: Ramesvaram:"

a, b. Ramesvaram.

The present collection includes two complete colonies of this species. The larger colony was found lying free in the lagoon of Pulli Island. It has a greater diameter of 54 cm. at its top and a total height of 38 cm., including a base, 16 cm. thick. Another small colony from Manauli Island is 17 cm. at the top and 12 cm. in height. The details of the growthform and measurements of calices show no marked variation from those given by Brook, except that a few of the radials are upto 2 mm. in thickness. The axial corallites have 12 septa with large subequal primaries. Younger radials usually have only the first cycle of septa, with larger directives. In older radials, however, both the cycles are well developed.

Colour:

Living coral brown with white axial corallites. The species is notable for the large quantity of mucus that it extrudes when it is taken out of water.

Localities:

Pulli Island; Manauli Island; Rameswaram (Brook).

Distribution:

Red Sea; Somaliland; Gulf of Mannar.

Acropora thurstoni (Brook), 1893.

(Pl. IV, fig. 5).

Madrepora thurstoni Brook, 1893, p.200, pl.35, fig. A.

The species is not uncommon at Mandapam (Palk Bay). Samples from 2 fair sized colonies agree perfectly with Brook's description and figure of this species, in their growthform

and calicular characters. Yet a third colony found lying free, shows some noteworthy variations in its calicular characters, though essentially belongs to this species. It is described in detail below.

Description:

Corallum cespito-corymbos, 48 cm. wide, 30 cm. high. Base thick, solid, 12 cm. thick, with numerous branches. Main branches 1.5 to 2 cm. thick at their base, subdividing 2 or 3 times to give rise to branchlets 1.5 to 2.5 cm. in length and 6 to 10 mm. thick with much tapering tip. Total height of branches including the branchlets 10 to 12 cm. Peripheral branches horizontal, sometimes coalascent.

Axial corallites 2 to 2.5 mm. diameter, 2 to 2.5 mm. exsert, wall thin moderately porous; opening rounded; primary septa well developed, secondaries of varying numbers, cycle rarely complete.

Prominent radial corallites are confined to the top of branchlets where they are mariform and ascending. Larger radials 2 to 2.5 mm. in length and 1 to 1.5 mm. thick rarely 2 mm.; outer wall thickened, moderately porous. Septa in 2 cycles but secondaries smaller and cycle incomplete. Directive septa much prominent and often reach the centre of the calyx. On the main divisions and on the lower parts of the branchlets all the radials are subimmersed or immersed.

Wall of the radials striated with weak echinulations. Surface coenenchyme vermiculate, rarely echinulate; corallum dense in section.

Locality: Mandapam (Palk Bay).

Distribution:

Gulf of Mannar around Mandapam. The species is not known from any other localities outside this place.

Remarks:

This specimen described in detail, differs from Brook's type in its more exsert axial corallites and slightly larger radial corallites. Further the corallum is denser. In spite of these differences the author does not wish to separate them, since the difference is only comparative.

Acropora obscura (Brook), 1893.

(Pl. V, fig. 1)

Madrepora obscura Brook, 1893, p.129, pl.32, fig. A.

Description:

Corallum composed of thick prostrate main divisions with branches on both upper and lower sides. The lower branches 2 to 4 cm. long, 4 to 7 mm. thick and are pressed against the main divisions. Upper branches single or in groups of 2 to 4, angular, 3 to 5 cm. long, 6 to 12 mm. thick, apices blunt or suddenly tapering with 2 to 4 small proliferations.

Axial corallites cylindrical 2.5 to 3 mm. diameter, 1 to 2 mm. exsert, wall thick and porous; opening rounded; septa 12.

Prominent radial corallites nariform, inner wall less developed, 2 to 3 mm. long about 2 mm. in diameter. Just below the axial corallites the radials are small and uniform sized giving a sudden tapering effect to the top of branches.

A few larger radials below bear buds which in their turn may grade towards branchlets. Scattered among the nariform corallites there are a few immersed ones. Below 2 to 3 cm. from the tip of branches all the corallites are immersed. Immersed corallites 0.4 to 0.7 mm. diameter, a diameter to a millimeter apart. First cycle of septa well developed with larger directives. Second cycle small, rarely complete.

The wall of the radials porous, outer side "striated and echinulate". Surface coenenchyme strongly echinulate; corallum somewhat dense in section.

Colour:

Brown with pink axials.

Locality:

Mandapam (Palk Bay). Not a common species, only a single colony could be collected.

Distribution:

Gulf of Mannar and Palk Bay around Mandapam; Great Barrier Reef.

Acropora sp.

(Pl. V, fig. 2).

Description:

Two colonies with greater diameters 35 and 40 cm. respectively are placed here. Corallum half-vasiform with a narrow base as if pedicellate, main branches prostrate, 1.5 to 2 cm. thick, coalascent, with branchlets on either side. Lower

branchlets scattered, small, insignificant, 1 to 1.5 cm. long, 3 to 6 mm. thick. Upper branchlets 4 to 5 cm. in height upto 10 mm. thick, sometimes irregularly swollen, with 2 to 4 radiating secondary branchlets 1.5 to 2 cm. long and 4 to 6 mm. thick with suddenly tapering apices. A few branches at the basal part of the colonies are upto 10 cm. in length.

Axial corallites 2 mm. diameter 1.5 to 2 mm. exsert, wall very thin and porous; opening large and rounded; septa 6, subequal.

Radial corallites chiefly immersed except at the extreme tip of branchlets (about 1 cm. from top below). Projecting radials at the tip of branchlets nariform, 1 to 1.5 mm. diameter and in length. The nariform radials are more common on the peripheral branchlets than on the central ones. Septa generally not recognizable in projecting radials. Immersed corallites average 0.5 mm. in diameter usually a mm. apart, with a rudimentary set of primary septa; sometimes they are abortive.

Wall of the radials striated with small echinulations. Surface coenenchyme reticulate, striated and echinulate. Corallum moderately porous in section.

Colour:

Brown with white axial corallites.

Locality:

Mandapam (Palk Bay).

Remarks:

The specimens described approach to A. oligocyathus (Brook),

in their calicular and septal characters, but the growthform appears to be different, especially in having larger, subdividing upper branchlets. However, it is not a common member of the genus here.

Acropora corymbosa (Lamarck), 1816.

(Pl. V, fig. 4)

Madrepora corymbosa Lamarck, 1816, p.279; 2nd ed. p.447.
Brook, 1893, p.97.

Acropora (Polystachis) corymbosa Vaughan, 1918, p.171, pl.67, fig. 1.

Acropora corymbosa Hoffmeister, 1925, p.62, pl.13, figs. 1a, 1b, 1c.
Thiel, 1932, p.121, pl.18, fig. 2; pl. 19, fig. 2.
Crossland, 1952, p.211.
Wells, 1954, p.420, pl.116, figs. 3 to 6; pl.117, figs. 1,2.
Stephenson and Wells, 1956, p.12.

Madrepora pectinata Brook, 1893, p.95, pl.27, figs. D, E.

Acropora (Polystachis) pectinata Vaughan, 1918, p.172, pl.71, figs. 1, 1a, 1b, 1c, 2.

Description:

A generalized description of the species based on a large suit of specimens is as follows.

Corallum corymbose or vasiform with a narrow base. Larger colonies noticed around Mandapam may attain a greater diameter of

50 to 70 cm. In vasiform specimens the main branches about 1 cm. thick, irregularly coalascent with complanate under surface bearing nariform, subimmersed or immersed corallites. A few branchlets are usually present at the under side, that are pressed to the general plane of the main branches. Branches on the upper side of the vase arched, either remaining single or dividing into 2 or 3 at the base or at mid-height. They are 3 to 5 cm. long and 6 to 8 mm. thick at the base, their tips being 1.5 to 2 cm. apart.

Axial corallites 1.5 to 2 mm. in diameter, about 1.5 mm. exsert; wall porous, not much thickened, reticulate and costulate; opening rounded, large. Primary septa well developed and subequal or in a few calices the directives larger than the others. Secondaries scarcely developed, in no case represented by more than 4.

Radial corallites tubo-labellate or half-tubular, ascending appressed, 2.5 to 3 mm. long, 1 to 1.5 mm. thick, the larger ones often with 1 or 2 buds. Inner wall scarcely developed, the outer sometimes slightly curved up. Projecting radials loose their significance at the basal part of the branchlets and on the main divisions, where almost all corallites are immersed. Primary septa well developed with prominent directives. Secondaries usually not recognisable.

Outer wall deeply striated with a few echinulations at the base. Coenenchymal surface costulate and echinulate; corallum porous in section.

Colour:

Living coral brown, with white or purple axial corallites.

Localities:

Mandapam (Palk Bay), Mandapam (Gulf of Mannar), Pulli Island, Manauli Island, Hare Island. The species is especially abundant at Mandapam (Palk Bay).

Distribution:

A widely distributed Indo-Pacific species from Red Sea to Samoa.

Remarks:

The species is highly variable in its skeletal characters and growthform. In some vasiform specimens, especially those found on sandy bottom, the main horizontal branches undergo complete fusion by deposition of coenenchyme between them, resulting in thick plates, the upper surface of which bear branchlets.

Acropora hyacinthus (Dana), 1846.

(Pl. V, fig. 6).

Madrepora hyacinthus	Dana, 1846, p.444, pl.32, fig. 2.
Acropora hyacinthus	Hoffmeister, 1925, p.64, pl.13, fig. 3; pl.14, figs. 1a to 1d.
	Wells, 1954, p.421, pl.118, figs. 3, 4; pl.120, figs. 3, 4, 5.
	Stephenson and Wells, 1956, p.15.
Madrepora cytheria	Brook, 1893, p. 99 (Synonymy).

Madrepora armata Brook, 1893, p. 100, pl. 10, figs. A, B.

Acropora diomedeae Vaughan, 1906, p. 69, pl. 7, figs. 1, 1a; pl. 8, figs. 2, 3.

Description:

Corallum vasiform, pedicellate with reticulately coalescent main branches 8 to 10 mm. thick, with wide interspaces. The largest colony noted measured 70 cm. in greater diameter. Under side of the vase is supplied with veruciform or nariform corallites. A few branchlets that are present at the under side, are pressed to the general plane of the vase. Branchlets on the upper side small, crowded, single or in groups of 2 to 4. They are 1 to 2 cm. long, but generally about 1.5 cm. and are 4 to 6 mm. thick at the base with tapering apices. Distance from top to top of adjacent branchlets varies from 8 to 10 mm.

Axial corallites about 1.5 mm. in diameter, 1.5 to 2 mm. exsert with thin and porous wall. Outer side of the wall costulate. Opening oval or rounded. Primary septa well developed with larger directives; secondaries of varying numbers, cycle sometimes complete.

Radial corallites labellate, ascending often with styliform lips; 2 to 2.5 mm. long, 1 to 1.5 mm. in diameter. At the lower part of branches and on the main divisions all radials are immersed. Immersed corallites about 0.75 mm. in diameter, a diameter to a millimeter apart. Primary septa complete. The directives very large and sometimes meet in the centre. Secondaries rudimentary, cycle scarcely complete.

Wall of the radials fragile, porous in young, getting compact in older ones. Outer side striated and echinulate at the base. Surface of the coenenchyme reticulate and echinulate; porous in section.

Colour:

Brown with white axial corallites.

Localities:

Mandapam (Palk Bay). A complete pedicellate corallum 24 cm. in greater diameter from Andaman Islands is also placed under this species.

Distribution:

Red Sea; Tanganyika (Talbot, 1965); Ceylon; Mandapam; Maldives; Andaman Islands; Singapore; Philippines; Great Barrier Reef; Marshall Islands; Samoa and Tahiti.

Remarks:

All the present specimens are referrable to A. hyacinthus forma cytherea (Dana).

Acropora surculosa (Dana), 1846.

(Pl. V, fig. 5).

Madrepora surculosa	Dana, 1846, p.445, pl.32, figs. 4, 5.
	Brook, 1893, p.104.
Acropora surculosa	Crossland, 1952, p.214, pl.38, figs. 2 to 5.
	Wells, 1954, p.421, pl.118, figs. 1, 2; pl.119, figs. 1, 2, 3.
	Stephenson and Wells, 1956, p.19.

Madrepora recumbens Brook, 1893, p.106, pl. 27, fig. F.

Description:

Corallum vasiform, pedicellate, main branches coalascent. In some specimens the fusion of the branches is almost complete with little interspaces between them. Under side of the vase may bear a few branchlets, often pressed to the general plane of the main branches. The dominance of the branchlets at the under surface seems to be controlled by the position of the vase, i.e. whether vertical, slanting or horizontal. Branchlets on the upper side 2 to 3.5 cm. long, 7 to 8 mm. thick, angular below, single or in groups of 2 to 5 with small proliferations at their tapering tip. Branchlets of the growing edges of the colony are larger and horizontal.

Axial corallites 1.5 to 2 mm. in diameter, 1 to 1.5 mm. exsert; wall thin, porous, opening rounded or oval; septa in two cycles, primaries large, secondaries extend half to the width of the primaries.

Projecting radials labellate or gutter shaped, much crowded, lips thin and rounded, spreading, but not generally at right angles. They are about 2 mm. length, 1.25 to 1.5 mm. in top diameter, the larger ones with buds at the base. On the basal part of the branchlets and on the upper side of the main branches majority of the radials are immersed. Six septa can be generally seen in the radials.

Wall of the radials porous, fragile, with strongly striated and serially echinulate outer side. Surface coenenchyme striated and echinulate. It is porous in section.

Localities:

Manauli Island, Hare Island, Rameswaram (Brook).

Distribution:

Tanganyika (Talbot, 1965); Gulf of Mannar; Mergui Archipelago; Great Barrier Reef; Low Isles; Fiji; Marshall Islands and Tahiti.

Remarks:

The species differs from Acropora corymbosa by its round tipped, labellate and much crowded radials which are much spreading than in A. corymbosa. The species forms large platforms around Manauli Island but appears to be totally absent on the reefs of Mandapam (Palk Bay).

Acropora spicifera (Dana), 1846.

(Pl. V, fig. 3).

Madrepora spicifera	Dana, 1846, p.442, pl.33, figs. 4, 5; pl.31, fig. 6.
	Brook, 1893, p.92 (Synonymy).
Acropora (Lenidocyathus) spicifera	Vaughan, 1918, p.172, pl.68, figs. 3, 3a,3b.
Acropora spicifera	Wells, 1954, p.421, pl.121, figs. 1, 2, 3.

Description:

Corallum corymbose about 30 cm. in greater diameter, with horizontal main branches undergoing occasional fusion. No well developed branchlets are noticed at the under side. Under side of the main divisions provided with nariform and immersed corallites. Branches on the upper side small, 1 to 1.5 cm. long, 5 to 7 mm. thick with tapering apex.

Axial corallites about 2 mm. in diameter, 1 mm. or so exsert. Wall a little thickened, porous and costulate. Opening rounded about 1 mm. in diameter. Septa 12, primaries large extending to the center of the axial fossa; secondaries smaller, reaching half of the width of the primaries.

Projecting radials labellate, or dimidiate, 1.5 to 2 mm. in length, 1 to 1.5 mm. in top diameter. Outer wall much thickened and flaring out. Opening rounded with the plane of the aperture perpendicular to the long axis of the branches. Below the branch tip all the radials are immersed. Two well developed cycles of septa are present in the radials.

Outer wall of the radials striated and echinulate. Surface of the coenenchyme reticulate and echinulate; coenenchyme porous in section.

Colour:

Corallum brown with white axial corallites.

Locality:

The single specimen in the present collection was obtained from the western side of Krusadai Island. Gravely (1927) has also recorded it from the same locality, but has not described or figured it.

Distribution:

Gulf of Aden; Tanganyika (Talbot, 1965); Ceylon; Krusadai Island; Singapore; Cocos-Keeling Islands; Great Barrier Reef; Fiji; Tongatabu; Marshall Islands.

Remarks:

As it was already been pointed out by Wells (1954), the species is very near to A. surculosa (Dana). But A. spicifera has shorter and much more tapering branchlets than in the other species. Further the lips of the radial corallites of the present species are much more thickened than in the other. From A. hyacinthus (Dana) it differs by its shorter but thicker spreading radials.

Acropora indica (Brook), 1893.

(Pl. VI, figs. 2, 3).

Madrepora indica Brook, 1893, p.113, pl.34, fig. A.

Description:

Corallum cespito-corymbose, pedicellate, 22 x 20 cm. at the top with a total height of 16 cm. Main branches about 1 cm. thick at the base, subdividing 2 or 3 times. Ultimate branches 1.5 to 2.5 cm. in length, 6 to 8 mm. in diameter with a suddenly tapering apex, often bearing 2 or 3 small proliferations.

Axial corallites cylinderical, 2.5 to 3 mm. in diameter about 2 mm. exsert with thick porous but fragile and costulate outer wall. Opening rounded. Primary cycle of septa large with the directives meeting deep down in the center of the calyx. Secondaries smaller but well defined, cycle generally complete.

Projecting radial corallites are confined to the top of branchlets where they are nariform, half-tubular and labellate, much crowded, spreading with a few laterally compressed ones.

In some nariform corallites the outer wall flares out almost perpendicular to the branch surface. The prominent nariform radials are 1.5 to 2 mm. long and 1 to 1.5 mm. in diameter. Outer wall of the radials a little thickened with large oblique openings. Labellate corallites less than a mm. in length and diameter. A few large half-tubular ones bear 1 to 2 buds. Towards the base of the branchlets and on the main branches majority of the radials are immersed. Younger radials have only the directives of the primary cycle of septa developed. However, in older radials all the primaries may be recognized.

Wall of the radials porous, outer side striated and echinulate. Surface of the coenenchyme supplied with uniform "spinose plates". Coenenchyme porous in section.

Colour:

Corallum brown with white axial corallites.

Localities:

Manauli Island; also from Rameswaram (Brook).

Distribution:

Gulf of Mannar around Mandapam.

Remarks:

This is the first record of the species ever since it was described by Brook. Unfortunately Brook (loc. cit.) has not given the measurements for the radials and his figure of the species is of little help in working out the details. Based on the present material, Brook's original description is appended here by adducing the measurements of the radials.

Acropora squamosa (Brook), 1892.

(Pl. VI, figs. 5, 6).

Madrepora squamosa	Brook, 1893, p.120, pl.20, fig. 3. (Synonymy).
Acropora (Lepidocyathus) squamosa	Vaughan, 1918, p.173, pl.72, figs. 1, 2, 2a, 3.
Acropora squamosa	Crossland, 1952, p.116.
	Stephenson and Wells, 1956, p.18.

A generalised description of the species based on a large number of colonies studied both in the field and in the laboratory, follows.

Corallum corymbose, with an expanding base. Larger colonies 30 to 40 cm. in diameter, 20 to 30 cm. in height. Main branches subdivide 2 or 3 times. Peripheral branches prostrate with occasional coalascence. Top most branchlets 3 to 6 cm. long, 7 to 10 mm. thick, with blunt or tapering tip often with a few proliferations.

Axial corallites 2 to 2.5 mm. in diameter, about 1.5 mm. exsert with slightly thickened porous, reticulate wall. Opening small and rounded with two well developed cycles of septa. Primaries large and sometimes meet deep down in the calyx; secondaries smaller.

Radial corallites scale like, much crowded, arranged in close ascending spirals. Inner wall absent, outer wall a little thickened with rounded lip. The angle of the radials with the surface of the branch vary greatly in different specimens, but

generally they are at right angles. The measurements of the radial corallites exhibit marked variation in different colonies. In some specimens they are small, about 1 mm. in length and diameter, thus agreeing with Brook's type. In other cases they are larger, 1.5 to 2 mm. in length and diameter with smaller ones interspaced. Opening rounded, septa in two cycles, the lower directive very prominent, others rudimentary. Towards the base of the upper branches and on the main division radials are all immersed. Immersed corallites are wanting where projecting radials dominate.

Outer side of the radials striated and echinulate, texture porous in young, slightly compact in older ones. Surface coenenchyme striated and echinulate; moderately porous or rather dense in section.

Colour:

Corallum dull green with pink axial corallites.

Locality:

Mandapam (Palk Bay). Not seen in the Gulf of Mannar side.

Distribution:

Previously known from Murray Island; Low Isles; East Indies and Rocky Island. The present record extends its distribution to Mandapam (Palk Bay).

Remarks:

The species is highly variable in its size of the radial corallites and in the texture of the corallum. It is possible

that, A. millepora (Ehrenberg) as described by Brook (1893) may fall within the limit of variation of this species. However, Brook's specific name squamosa is retained here for the species.

Acropora hebes (Dana), 1846.

(Pl. VI, fig. 4).

Madrepora hebes	Dana, 1846, p.408, pl.35, fig. 5.
	Brook, 1893, p.128.
Acropora (Lepidocyathus) hebes	Vaughan, 1918, p.174, pl.73, figs. 2, 2a; pl.74, figs. 1, 2, 2a, 2b.
	Mayer, 1918, pl. 13, fig. 6.
Acropora hebes	Hoffmeister, 1925, p.57, pl.9, figs. 3a,3b.
	Wells, 1950, p.36.
	Crossland, 1952, p.217.
	Wells, 1954, p.423, pl.104, fig. 3.
	Stephenson and Wells, 1956, p.14.

Description:

Part of a fruticose corallum with stout branches arising from an incrusting base, is placed under this species. The largest branch is slightly more than 4 cm. in height, others smaller. The thickness of the branches at the base vary from 12 to 17 mm., with slightly tapering apex.

Axial corallites 3 to 3.5 mm. in diameter about a mm. exsert. Wall of the axials thick, porous, reticulate; opening rounded, about one-third the diameter of the calyx. Primary septa large, almost meeting in the centre. Secondaries smaller but distinct. Both cycles complete.

Radial corallites small, crowded, labellate, inner wall absent, outer wall generally perpendicular to the long axis of the branches; lips thin and porous. Larger radials are about 1 mm. in length and 1 to 1.5 mm. in width; many are smaller towards the basal parts of the branches. A few are immersed, and are found scattered among the major ones. Primary septa well developed with large directives. Vaughan (loc. cit.) has stated that the upper directives of his specimen were more conpicuous than others. But in the present specimen, the upper, the lower, or both may be equally prominent. When both are large they usually meet. In larger radials a few of the second cycle may also be developed.

Outer wall of the radials striated. Surface of the coenenchyme reticulate and echinulate; moderately porous in section.

Locality:

Andaman Islands.

Distribution:

Andaman Islands; Mergui Archipelago (Duncan, 1889); Formosa (Taiwan) (Kawaguti, 1953); Great Barrier Reef; Low Isles; Marshall Islands and Samoa.

Acropora sp. cf. exigua (Dana), 1846.

(Pl. VI, fig. 1).

Madrepora exigua	Dana, 1846, p.469, pl.38, fig. 2.
	Brook, 1893, p. 125.
Acropora exigua	Hoffmeister, 1925, p.57, pl.9, figs. 1a, 1b, 2.

Description:

Corallum cespito-corymbose, with an expanding base enclosing a dead massive coral. Main branches slender, wide apart, subdividing, 8 to 10 mm. thick at the base and upto 10 cm. long including the branchlets. Top most branchlets 2.5 to 4 cm. long, 6 to 7 mm. thick, apices tapering.

Axial corallites 2.5 to 3 mm. in diameter, in some upto 4 mm.; 1.5 mm. exsert with highly thickened porous wall with costules and synapticulae. Opening rounded; septa 12, primaries larger and subequal.

Prominent radials small, labellate and nariform, wide apart with a few immersed ones intercalated. Larger nariform corallites about 1.5 mm. in length and diameter and often bear 1 or 2 buds at the base. Smaller nariform and labellate ones less than a mm. in length and diameter. Lip of the outer wall a bit swollen, opening rounded or oval, plane of aperture perpendicular to the long axis of the branches. Towards the lower part of the branches majority are subimmersed or immersed. Immersed corallites 0.5 to 0.7 mm. in diameter about a mm. apart. First cycle of septa usually complete with prominent directives. In larger nariform corallites however, a few of the secondaries are also visible but the cycle is not complete. In the immersed corallites generally the directive septa meet in the centre.

Outer wall of the radials striated and echinulate, porous in texture. Surface of the coenenchyme reticulate and echinulate. Coenenchyme porous in section.

Colour:

Corallum brown with bluish axial corallites.

Locality:

The single specimen in the present collection was obtained from Mandapam (Palk Bay). This is not a common member of the genus.

Distribution:

Mandapam (Palk Bay); New Hebrides; Solomon Island; Fiji and Samoa.

Remarks:

According to Hoffmeister "the distinguishing features of this species are its narrow, slow tapering branches, and the characteristics of the radial corallites". The present specimen agrees in most of its characters to Hoffmeister's description and figures of this species. The species is first time recorded from the Indian ocean.

Acropora humilis (Dana), 1846.

Madrepora humilis	Dana, 1846, p.483, pl.31, fig. 4; pl.41, fig.4.
Acropora humilis	Wells, 1954, p.425, pl.100, fig. 1; pl.126, figs. 1 to 6; pl.127, fig. 3, 4; pl.128, figs. 3, 4, 5. (Synonymy).
	Stephenson and Wells, 1956, p.15.

Wells (loc. cit.) has given the following description of this species.

"Corallum cespitose or corymbose; branches upright, obtuse cylinderical to short conical, 1.0 to 2.5 cm. thick, rarely less than 1.5 cm. Axial corallites 2 - 6 mm. in diameter usually between 2.5 and 4.0 mm., hemispherical, sometimes slightly exsert. Radial corallites usually thick walled, spreading from 45° to 90° , 1.5 - 2.5 mm. in diameter, inner wall weak or developed; aperture normal to axis of corallite, oblique, dimidiate, or even gutter shaped. Septa usually well developed. Coenenchyme spongy to evenly echinulate; walls of radials striato-echinulate to echinulate".

This widespread Indo-Pacific species is not uncommon on the various reefs around Mandapam, especially on the Gulf of Mannar side. A fair suit of specimens was examined during the present investigation. The largest colony collected is 30 cm. in greater diameter; with thick digitiform branches, 1.5 to 2 cm. thick and 6 to 8 cm. long. The growth-form is cespitose. In calicular and septal characters this specimen agrees with Brook's (1893) description of Madrepora scherzeriana. Three other colonies possess subcorymbose corallum with stout, obtuse, branches and thick axial corallites 4 to 4.5 mm. in diameter. These specimens match with Vaughan's (1918) figure (pl.77, fig. 1a) of A. gemmifera. The axials as well as the radial corallites have 12 well developed septa. Three specimens obtained from Andaman Islands possess cespitose corallum.

Colour:

Corallum brown with white, blue or purple axial corallites.

Localities:

Mandapam (Palk Bay), Krusadai Island, Manauli Island, Hare Island and Andaman Islands.

Distribution:

Wide spread from Red Sea to Samoa.

Remarks:

Wells (loc. cit.) after a study of a "large suit of specimens including types" has shown that, at least seventeen of the previously described 'so called species' of Acropora, are nothing but variations of a single species namely A. humilis (Dana); thus considerably reducing the number of species considered by Brook (1893) under his subgenus Tylopora. The species treatment adopted in the present work is that of Wells.

Acropora diversa (Brook), 1891.

(pl. VII, fig. 1).

Madrepora diversa	Brook, 1893, p.141, pl.16, fig. 3.
Acropora diversa	Wells, 1954, p.424, pl.117, figs. 3 to 6.
Acropora otteri	Crossland, 1952, p.229, pl.43, figs. 1, 2; pl.44, figs. 1, 2.

Description:

Corallum cespitose with a broad encrusting base. Greater diameter at the top 30 cm. Branches numerous single or dividing into 3 or 4 subequal ones; 4 to 6 cm. long, 10 to 12 mm. thick at the base, apex tapering with small proliferations. Peripheral branches oblique or horizontal.

Axial corallites generally 3 mm. in diameter at the top, slightly more at the base; 1 to 1.5 mm. exsert; wall thick, porous, outer side costulate with synapticulae; opening small and rounded, less than a mm. in diameter. Septa 12, primaries large and sometimes extending to the centre of the calyx.

Radial corallites tubular, both proliferous and non-proliferous. Proliferous ones 7 to 9 mm. large, 2 to 3.5 mm. thick; non-proliferous ones 4 to 5 mm. long about 2 mm. in diameter. The inner wall stands a bit below the level of the outer; in a few cases their tip being slightly compressed. Immersed and subimmersed corallites are found scattered among the tubular ones. In younger radials apparently only the directive septa are developed; in older ones, however, the first cycle of septa is complete. In proliferous corallites both the cycles are seen.

Wall of the radials porous, outer side striated with linear plate-like costules. Surface of coenenchyme reticulate and echinulate; moderately porous in section.

Another specimen caught entangled in a fishing net, from the northern side of Hare Island was found growing on a dead branch of an Acropora. The colony has a greater diameter of 17 cm. at the top. Branches are shorter than in the previous specimen only being 2 to 4 cm. long with obtuse apex. Axial corallites 3 to 4 mm. thick. The wall of the radial corallites are more thickened than in the Krusadai Island specimen, thus obliterating greatly the opening.

A branch 4.5 cm. long and 10 mm. thick from Andaman Islands resemble the specimen already described from Krusadai Island.

Colour:

Corallum brown with white axial corallites.

Localities:

Krusadai Island, Mare Island and Andaman Islands. The species is not common around Mandapam.

Distribution:

Diego Garcia; Tanganyika (Talbot, 1965); Gulf of Mannar; Andaman Islands; Great Barrier Reef; Low Isles; Thursday Island; Marshall Islands.

Remarks:

The present specimens almost agree A. otteri Crossland in their calicular characters and growthform.

Acropora digitifera (Dana), 1846.

(Pl. VII, fig. 2).

Madrepora digitifera	Dana, 1846, p.454.
	Brook, 1893, p.75.
Acropora (Tylopora) digitifera	Vaughan, 1918, p.175, pl.76, figs. 1, 1a, 2.
Acropora digitifera	Wells, 1954, p.427, pl.127, figs. 1, 2.
	Stephenson and Wells, 1956, p.13.
	(NOT)Crossland, 1952, p.207, pl.35, fig. 2.

Two cespitose coralla measuring 11 cm. and 5 cm. respectively in their top diameters are placed under the species.

Description:

Branches digitiform, 4 to 7 cm. long, about 1 cm. thick, single or in groups of 2 to 4 with slightly tapering apex.

Axial corallites 3.5 to 4 mm. in diameter, about 2 mm. exsert; wall thickened, and porous. Septa 12; primaries large, secondaries half as long as the primaries.

Prominent radial corallites labellate, both proliferous and non-proliferous. The former ones may grade into branchlets. Non-proliferous corallites at the tip of branches 1 to 1.5 cm. in length and width. The corallites attain their maximum size at the middle part of branches. Fully developed radial corallites 2 to 2.5 mm. long, about 2 mm. in diameter 2 to 3 mm. apart with a few small labellate and immersed ones intercalated. Outer wall of the radials thickened with rounded lips; spreading at right angles to the branch surface. Opening large, rounded. The lower directive septa much prominent, other primaries smaller; secondaries scarcely recognised. Towards the base of the branches the corallites become shorter, thicker, bursiform, and finally immersed. Immersed corallites small, about 0.5 mm. in diameter with well developed primary septa.

Wall of the radials porous in young, getting compact in older ones. Outer side striated. Surface coenenchyme reticulate with weak echinulations; dense in section.

Colour:

Corallum yellowish brown with purple axial corallites.

Locality:

Mandapam (Palk Bay). Not a common species.

Distribution:

Madagascar; Mandapam; Low Isles and Marshall Islands.

Acropora erythraea (Klunzinger), 1879.

(Pl.VII, figs. 4, 5, 6).

Madrepora erythraea Klunzinger, 1879, pt.2, p.14, pl.3, fig.5; pl.4, fig.8; pl.9, fig. 10.

Brook, 1893, p.157.

Gravely, 1927, p.47.

Several stout stemmed cespitose specimens are provisionally assigned to the species. The specimens agree with Brook's description of the species.

Description:

Corallum cespitose, average sized colonies 10 to 15 cm. in height and 15 to 20 cm. in greater diameter. Branches digitiform 2 to 7 cm. long, 8 to 10 mm. thick, apex slightly tapering or blunt with several small proliferations. In many cases it was noticed that part of the colony is killed followed by over-growth of fresh coenenchyme over the branches causing considerable abnormal thickening of the branches. Peripheral branches horizontal, sometimes coalascent, under side with large tubular corallites.

Axial corallites 3 to 4 mm. in diameter, rarely upto 5 mm.; 1 to 1.5 mm. exsert, wall about 1 mm. thick, texture somewhat porous. Outer side reticulate; opening rounded and small with two well developed cycles of septa; primaries subequal slightly larger than the secondaries.

Prominent radial corallites half-tubular, ascending, 2 to 4 mm. long, 2 to 2.5 mm. in diameter. Outer wall thickened or

thin, when thin a bit tapering and curved up with broader basal part. A few are decisively tubular and bear buds. Shorter and smaller radials are often found among the major ones. Opening oblique and is in some cases laterally compressed when the outer wall is thickened. Towards the base of the branches all the radials are immersed. Immersed corallites 0.75 to 1 mm. in diameter and are 1 to 2 mm. apart. Projecting as well as immersed radials possess two cycles of septa, primaries large, directives much pronounced; secondaries smaller.

Wall of the radials porous, outer side striated. Surface coenenchyme reticulate; dense in section.

Colour:

Corallum brown with white or blue axial corallites.

Localities:

Mandapam (Gulf of Mannar), Krusadai Island, Pulli Island, Manauli Island and Hare Island. A fairly common species here.

Distribution:

Red Sea; Maldives; Mauritius; Gulf of Mannar around Mandapam; Great Barrier Reef.

Acropora variabilis (Klunzinger), 1879.

(Pl. VII, fig. 3).

Madrepora variabilis Klunzinger, 1879, pt.2, p.17, pl.1, fig. 10; pl.2, figs. 1, 5; pl.5, figs. 1, 3; pl.9, fig. 14.

Brook, 1893, p.161.

Acropora variabilis — Marenzeller, 1906, p.49, pl.15, figs. 40 to 44.
Vaughan, 1918, p.181, p.80, figs. 2, 3, 3a, 3b.
Wells, 1950, p.38.
Crossland, 1952, p.222, pl.38, figs.1,2.
Wells, 1954, p.428, pl.128, figs. 1, 2; pl.130, figs. 1, 2.
Stephenson and Wells, 1956, p.59.

Description:

Two corymbose coralla 13 cm. and 10 cm. respectively in greater spread, are assigned to the species. Main branches 10 to 12 mm. thick at the base, subdividing into smaller ones. Top branches 3 to 5 cm. long, 6 to 8 mm. thick, tip tapering.

Axial corallites 3 to 3.5 cm. in diameter at the base lesser at the top, 2 to 2.5 mm. exsert. Wall thickened, moderately porous; outer side reticulate, opening rounded, about a mm. or less in diameter; septa in two cycles; primaries large and subequal sometimes meeting in the centre; secondaries smaller but well defined.

Radial corallites relatively uniform in size, tubular, ascending, arranged in irregular longitudinal rows parellel to the long axis of the branches. A few proliferous tubular ones are upto 5 mm. long and 2 mm. in diameter. Non-proliferous ones 3 to 3.5 mm. long, generally 1.5 mm. in diameter. The top of corallites in some cases just fuses with the base of the immediate higher one of the same row. Outer wall either slightly

thicker than the inner or both subequal in thickness. Towards the basal part of the main divisions a few become veruciform and finally immersed. The immersed corallites are generally absent among the projecting radials. Aperture of the radials elliptical or oval in outline, approximately one-third the diameter of the calyx. Wall of the radials moderately porous in young, getting dense in older ones. Septa in 2 cycles, primaries large, directives often meet in the centre; secondaries smaller but distinct.

Outer wall of the radials finely echinulate. Surface coenenchyme echinulate, or flaky in younger parts; dense in section.

Locality:

Andaman Islands.

Distribution:

Red Sea; Tanganyika (Talbot, 1965); Ceylon; Andaman Islands; Singapore (Purchon, 1956); Mergui Archipelago; Cocos-Keeling Islands; China Sea; Formosa (Taiwan) (Kawaguti, 1953); Low Isles; Fiji; Marshall Islands; Samoa.

Remarks:

The present specimens belong to the thin stemmed variety of this species. This widespread species appears to be absent from the reefs around Mandapam.

Acropora ceylonica (Ortmann), 1889

(Pl.VIII, fig. 1).

Madrepora ceylonica Ortmann, 1889, p.506, pl.12, fig. 3.

Brook, 1893, p.162.

Madrepora remota Ortmann, 1889, p.510, pl.13, fig. 6.

Description:

Corallum subcorymbose, with a small base. Greater diameter of the colony 35 cm., height 20 cm. Peripheral branches prostrate, coalascent with complanate under side. A few branchlets are found pressed to the plane of the horizontal branches, at the under surface. Upper branches 8 to 10 cm. long, 1 cm. thick at the base, single or bifurcating; lower part flattened, upper part rounded, tip conical with 2 to 5 proliferations.

Axial corallites conical in outline, 2.5 to 3 mm. in diameter at the base, 1.5 to 2 mm. at the top; about 2 mm. exsert. Wall not much thickened, moderately porous, outer side striated; opening rounded, septa 12, primaries larger than the secondaries, septa narrow at first, broader below.

Radial corallites irregular in size and shape, crowded in appearance, nariform, bursiform, lamellate or immersed. Nariform ones both proliferous and non-proliferous. The former, ascending or spreading, but rarely at right angles; 2 mm. in length, 1.5 to 2 mm. in diameter; outer wall thickened, tip rounded; opening rounded or laterally compressed; the plane of aperture sometimes at right angles to the long axis of the branch. Numerous shorter, nariform, labellate and immersed ones are found scattered among the larger ones. Towards the lower part of

the branches majority of the radials are immersed with a few proliferous ones at random. Immersed corallites 0.5 to 0.65 mm. in diameter, a diameter to 1 mm. apart. Both the cycles of septa are present, the lower directive being the largest.

Outer wall of the radials striated with plate-like echinulations. Surface of coenenchyme reticulate, with weak echinulations. Corallum porous in section in younger parts, dense in older parts.

Colour:

Corallum dull green with pink axial corallites.

Locality:

Manauli Island. Not a fairly common species.

Distribution:

Indian ocean - Ceylon; Manauli Island.

Remarks:

The species is characterised by its flattened branches, conical axial corallites, and irregular much crowded radial corallites.

Acropora polymorpha (Brook), 1891.

(Pl. VIII, fig.2).

Madrepora polymorpha	Brook, 1893, p.169, pl.31, figs. B to D. (Synonymy).
Acropora (Conocyathus) polymorpha	Vaughan, 1918, p.180, pl.81, figs. 1 to 5.
Acropora polymorpha	Wells, 1954, p.416, pl.105, figs. 2 to 5.

Description:

Corallum fruticose with a height of 26 cm. and a greater spread of 25 cm. Main branches arise from a small base. Branches stout, subdivide twice or thrice at their base to give rise to secondary branches 10 to 15 cm. long and 1 to 1.5 cm. thick. Tip of branches suddenly tapering. The branches bear a few horizontal branchlets 2 to 4 cm. long and 8 to 10 mm. thick. These branchlets are more common on the peripheral branches than on the central ones.

Axial corallites 2 to 2.5 mm. in diameter, 1 to 1.5 mm. exsert; wall slightly thickened, porous, outer side costulate with synapticulae; opening rounded about 0.75 mm. in diameter with 2 cycles of well developed septa, the directives being the largest.

Radial corallites unequal, nariform or half-tubular, inner wall absent or rudimentary, outer wall spreading, moderately thickened; usually at right angle to the branch surface. Tip of radials may or may not be elongated. Length of radials 2 to 3 mm., about 1.5 mm. in diameter. A few are tubular and bear buds. Below 5 to 6 cm. from the apex of the branches the corallites become shorter, bursiform and finally immersed. Immersed corallites are found saattered throughout the branches. Primary septa well developed, the directives especially the lower one much prominent; secondaries small, cycle rarely complete.

Wall of the radials porous, outer side striated. Surface coenenchyme reticulate and echinulate; somewhat dense in section.

Colour:

Corallum brown with white axial corallites.

Locality:

Mandapam (Palk Bay).

Distribution:

Mandapam; Malacca; Fanning Island; Fiji; Marshall Islands.

Remarks:

Only a single colony could be collected. Not a common member of the genus around Mandapam.

Acropora syringodes (Brook), 1892.

(Pl.VIII, fig. 3).

Madrepora syringodes	Brook, 1893, p.177, pl.33, fig. E. (Synonymy).
Acropora (Rhabdocyathus) syringodes	Vaughan, 1918, p.185, pl.83, figs. 1, 1a, 1b, 1c, 1d.
Acropora syringodes	Thiel, 1932, p.129, pl.10, fig. 3.
	Wells, 1954, p.428, pl.129, figs.3, 4; pl.130, figs. 5, 6.

Description:

Part of a corallum measures 15 cm. in greater spread with a main branch 12 mm. thick at the broken end. It divides into 6 branches radiating in different directions. The secondary branches 6 to 7 cm. long, each with several radiating branchlets 1 to 1.5 cm. long giving a bottle-brush appearance to the corallum.

Axial corallites on the main divisions and on the branchlets 2.5 to 3 mm. in diameter about so much exsert; wall thickened, moderately porous; opening rounded septa in 2 cycles, primaries large and subequal and meeting in the centre; secondaries extend two-third the length of the primaries, a few sometimes turn towards the sides of the primaries.

Radial corallites ascending, tubular, tubo-nariform; both proliferous and non-proliferous. The larger proliferous tubular corallites 6 to 7 mm. long, about 2.5 mm. in diameter. Larger non-proliferous ones 3 to 4 mm. long, 2 to 2.5 mm. in diameter with their inner wall less developed. Smaller nariform corallites are 1 to 1.5 mm. in length and diameter. Opening of the nariform corallites oblique. A few subimmersed and immersed corallites are seen scattered among the larger ones. Proliferous corallites have two cycles of septa as in the axials. In others primaries well developed with larger directives; secondaries rudimentary, cycle incomplete.

Wall of the radials moderately porous, outer side reticulate. Surface of the coenenchyme reticulate with weak echinulations. Corallum porous in section.

Locality:

Andaman Islands.

Distribution: Maldives (Wells and Davies, 1966).

Andaman Islands; South Seas; Banda Sea; Murray Island; Marshall Islands; Samoa.

Acropora echinata (Dana), 1846.

(Pl. VIII, fig. 4).

Madrepora echinata	Dana, 1846, p.464, pl.36, fig. 1.
	Brook, 1893, p.185.
	Studer, 1901, p.416, pl.29, fig. 8.
Acropora echinata	Vaughan, 1907, p.158, pls. 49, 50.
	Wells, 1954, p.423, pl.135, figs. 1 to 4; pl.136, figs. 1 to 6.
Acropora exilis (part)	Crossland, 1952, p.223, pl.39, fig. 3.

Description:

Corallum arborescent, 25 cm. in diameter and so much in height. Branches stout, 2 cm. thick at the base, subdividing with rare fusions among the branchlets. The branches and branchlets are supplied with numerous small ramiculi that vary from single elongated corallite to small branchlets 2 to 2.5 cm. long.

Axial corallites 2 mm. in diameter, 2 to 3 mm. exsert; wall thin and porous, opening large and rounded; only the primary cycle of septa visible.

Prominent radial corallites on the main branches between the ramiculi are chiefly nariform, 1 to 2 mm. long and 1.5 to 2 mm. in diameter with less developed inner wall. Majority of the radials on the main branches are immersed. The radials on the ramiculi are tubular, 6 to 12 mm. long but generally 7 to 9 mm., 1.5 to 2 mm. in diameter at the top with slightly more dilated base, angular in outline. The outer wall often stands a bit higher than the inner thus giving a beaked appearance to

the tip. Wall of the radials thin and porous, opening large with well developed primaries; secondaries not visible. Immersed corallites average 1 mm. in diameter, 1 to 2 mm. apart, septa poorly developed.

Outer wall of the radials with strong plate-like, closely arranged spinulations. Surface of coenenchyme, pitted and echinulate; the pores being oval, rounded, elongated or crescent shaped. Corallum porous in section.

Locality:

The exact locality of the present specimen is doubtful, but probably from either Palk Bay or Gulf of Mannar side of Mandapam. It was found without any label, in the reserve collection of the museum of the Central Marine Fisheries Research Institute, Mandapam Camp. No living colony could be seen during the present investigation.

Distribution:

Madagascar (Pichon, 1964); Mandapam; Philippines; Formosa (Kawaguti, 1953); Sulu Sea; Marshall Islands; Samoa; Hawaii.

Acropora procumbens (Brook), 1892.

(Pl. VIII, fig. 5).

Madrepora procumbens	Brook, 1893, p.188, pl.29, fig. D. (Synonymy).
Acropora procumbens	Thiel, 1932, p.130, pl.10, fig. 2.

Description:

Corallum prostrate, with a small base. Total length of colony 15 cm. Main branches slender, 8 to 10 mm. thick, at the

base, subdividing into smaller ones bearing several ramiculi 1.5 to 2 cm. length. The axial corallites is not much different in size and shape and in details of structure from the fully formed radials.

The prominent radial corallites slender, tubular, 4 to 8 mm. long, 1 mm. or slightly less in diameter at the top, upto 1.5 mm. at the base. Tip of the radials suddenly tapering; angular in outline, opening rounded or oblique where the inner wall stands a bit below the level of the outer. A few very small nariform and subimmersed and immersed corallites are seen on the main branches. Wall of the radials thin, porous; opening small with six moderately developed septa. Immersed corallites 0.5 to 0.7 mm. in diameter. Outer wall of the radials reticulate with serially arranged pointed echinulations.

Surface of the coenenchyme reticulate with weak echinulations; rarely pitted; dense in section.

Locality:

The single specimen in the present collection was obtained from Andaman Islands.

Distribution:

Andaman Islands; Singapore; Banda Sea; South Seas; Fiji.

Remarks:

The species differs from A. echinata (Dana) in its prostrate corallum with thinner branches and slenderer radials with tapering or contracted apex. Further, judging from the present

materials, the immersed corallites of A. echinata is larger and more numerous than in A. procumbens. Lastly it may be stated that the pitted nature of the corallum is more prominent in A. echinata than in the present species.

Genus MONTIPORA Quoy and Gaimard, 1830.

Montipora Bernard, 1897, p.1 (Synonymy).
Vaughan and Wells, 1943, p.108.

Genotype - Montipora verrucosa Quoy and Gaimard, 1830.

Generic characters:

Corallum variously shaped; encrusting, massive, foliaceous or ramose. Axial corallite absent. Corallites small, 1 to 2 mm. in diameter, level, non-protuberant with 2 cycles of septa. Coenenchyme porous. Exotheca and endotheca absent. Columella usually not present, if present rudimentary.

Based on the nature of the surface of the coenenchyme, Bernard (1897) has arranged the various species of this genus as belonging to the following four major groups.

1. Glabrous - The surface is smooth, i.e. composed of a fine reticulum.
2. Foveolate - The interstitial coenenchyme swells up around the calices forming ramparts.
3. Papillate - The interstitial coenenchyme rises up as papillae of different size and shape.

4. Tuberculate - The surface of the coral is covered by small, hispid or rounded tubercles.

Though the genus is one of the chief reef-builders of the Indo-Pacific, the total number of species of this genus altogether recorded from the Indian Ocean is much less when compared to the Pacific. Prior to the present work, the records of this genus from the seas around India, are only a few. Bernard (1897) has reported Montipora divaricata (= M. ramosa) and M. foliosa (Pallas) from Rameswaram. Gravely (1927) recorded M. explanata Bruggemann, and M. spongiosa (Ehrenberg) along with M. foliosa from Krusadai Island and neighbouring places. The present collection includes 18 species of Montipora, all obtained around Mandapam; out of which one is described as new to science. One of the earlier recorded species viz. M. spongiosa could not be re-collected. A complete list of Montipora described in this work with their respective localities is presented in Table IV.

TABLE IV

List of species of Montipora reported in this work with their local distribution and abundance. Species are listed in the order of their priority in the text.

S.No.	Name of the species	Localities					
		Mandapam (Palk Bay)	Mandapam (Gulf of Mannar)	Krusadai Island	Pulli Island	Manauli and New Islands	Hare Island
1.	Montipora subtilis Bernard	-	-	-	-	x	-
2.	M. granulosa Bernard	-	-	-	-	x	-
3.	M. explanata Bruggemann	x	-	x	-	-	-
4.	M. exserta Quelch	x	-	-	-	-	-
5.	M. digitata (Dana)	x	-	xxx	xxx	xxx	xxx
6.	M. divaricata Bruggemann	x	-	xx	xx	xx	xx
7.	M. turgescens Bernard	-	-	-	-	x	-
8.	M. manauliensis sp. nov.	-	-	-	-	x	-
9.	M. elscheneri Vaughan	-	-	-	-	-	x
10.	M. monasteriata (Forskål)	-	xx	-	-	-	-
11.	M. venosa (Ehrenberg)	-	-	x	-	-	-
12.	M. spumosa (Lamarck)	x	-	-	-	x	-
13.	M. edwardsi Bernard	x	-	-	-	-	-
14.	M. verrucosa (Lamarck)	-	-	-	-	x	-
15.	M. verrilli Vaughan	x	-	x	x	x	x
16.	M. informis Bernard	x	xx	x	-	x	x
17.	M. composita Crossland	x	-	-	-	-	-
18.	M. foliosa (Pallas)	x	xx	xxx	xxx	xxx	xxx

x = present

xx = fairly common

xxx = abundant

Smooth or glabrous explanate Montipora

Montipora subtilis Bernard, 1897.

(Pl. IX, fig. 1).

Montipora subtilis Bernard, 1897, p.21, pl.31, fig. 2.

Wells, 1954, p.433, pl.142, figs. 3, 4.

Description:

Corallum about 20 cm. in greater diameter; encrusting, growing layer over layer. The living layer upto 6 mm. thick at the central part and 2 to 3 mm. at the growing edges. An epitheca closely follows the growing edge.

Calices irregular in outline as minute punctures, not well bounded by a solid thecal wall; 0.35 to 0.52 mm. in diameter, 1 to 2 mm. apart. Primary cycle of septa well developed and reach half way to the centre of the calyx. Secondaries smaller, 3 to 4 per calyx, extending to half the length of the primaries. Sometimes they are rudimentary.

Surface coenenchyme smooth to the unaided eye, but an examination under the lens reveals a fine reticulum with small, delicate, pointed or compressed upright spines. Section of the coenenchyme shows a lower solid layer resting on the epitheca and an upper reticular layer.

Colour:

Living as well as washed and dried corallum yellowish-brown.

Locality:

Manauli Island. Not a common species.

Distribution:

Providence Reef; Mascarene Island; Manauli Island; Bikini Atoll.

Montipora granulosa Bernard, 1897.

(Pl. IX, fig. 2).

Montipora granulosa Bernard, 1897, p.21, pl.1, fig. 2; pl.31, fig. 3.

Crossland, 1952, p.181, pl.27, fig. 4.

Wells, 1954, p.434, pl.142, figs. 1, 2.

Description:

Corallum encrusting, 13 cm. in greater diameter with a maximum thickness of 8 mm. at its central part. Edges not free, 1 to 2 mm. thick with an epitheca. A few small cirripedes are found attached on the top which make the surface uneven.

Calices irregular in outline, not well cut out from the surrounding coenenchyme; 0.6 to 0.72 mm. in diameters, close together or upto 3 mm. apart. Primary septa well developed, crowded in appearance; secondaries smaller, 2 to 6 in different calices.

The coenenchymal surface reveals the usual 'velvety sheen' but under the magnifying lens it shows the presence of "minute plates bearing a row of two to five vertical slender spinules, or else a clump of the same, between them can be seen the rounded pores of the reticulum" (Crossland, 1952, p.181). Transverse section of the corallum shows a lower solid and an upper reticular layer.

Colour:

Corallum light yellow.

Locality:

Manauli Island. The specimen was found attached on a limestone brought ashore.

Distribution:

Previously known from Maccles field - China Sea; Great Barrier Reef and Marshall Islands. The present record extends its distribution to Gulf of Mannar.

Montipora explanata Bruggemann, 1879.

(Pl. IX, fig. 3).

Montipora explanata Bruggemann, 1879, p.577.

Bernard, 1897, p. 23, pl.1, fig. 3; pl.31, fig. 5.

Bruggemann's (loc. cit.) original description of the species runs as follows:

"Corallum explanate, spreading, incrusting. Surface uneven, in some places slightly tuberculate. Coenenchyme rather dense, consisting of confluent trabecles covered with small spinulous grains. Calices immersed, equal, distant by about twice the diameter. Twelve septa, but little developed, thin and narrow, one of the primaries always stouter and larger; the secondary ones sometimes rudimentary.

Height of corallum average 7 mm.; diameter of the calicular apertures, three-quarters of a mm.

Rodriguez (Slater); Mauritius (Brit. Mus.; Jena Mus.).

Distinguished from the preceding (i.e. M. incrustans, bracket is that of the present author) by its much larger calicular apertures, by the coarser coenenchymal tissue and less delicately spinulous surface; closely allied to M. scabricula, but the latter is a more massive species, with uniformly tuberculate surface. M. lichen, with which I was formerly inclined to unite it, has prominent calicles, a character totally absent in M. explanata".

Description of the present specimen:

Corallum explanate, about 25 cm. in greater diameter, closely encrusting, maximum thickness 8 mm. Upper surface is rendered uneven by the presence of a large number of gibbosities 1 to 2 cm. in width and 5 to 10 mm. in height.

Calices 0.7 to 0.85 mm. in diameter, irregular in outline, rather deep, crowded in appearance, not well demarcated from the surrounding coenenchyme by a solid thecal wall. They are much closer on gibbosities; upto a diameter apart on the level regions. Primary septa well developed with one of the directives highly pronounced. Secondaries generally not recognisable. But in a few calices 2 to 3 rudimentary ones may be seen.

Surface coenenchyme shows a fine reticulum, the meshes of which bear small upright spines and occasional scattered, low, round-topped tubercles, about 0.75 mm. in height. The presence of tubercles is however, not a marked feature of the species. Section of the corallum shows a solid lower layer and an upper thickening layer with vertical and horizontal elements.

Colour:

Corallum dull-brown.

Locality:

Mandapam (Palk Bay).

Distribution:

Mauritius; Rodriguez; Krusadai Island (Gravely, 1927); Mandapam (Palk Bay).

Remarks:

The species forms a connecting link between smooth explanate and explanate tuberculate Montipora. However, following Bernard (1897) it is considered here along with the former group. The species is not a common member of the genus, around Mandapam.

Montipora exserta Quelch, 1886.

(Pl. IX, fig. 4).

Montipora exserta Quelch, 1886, p.174, pl.8, figs. 5, 5a, 5b.
Ortmann, 1889, p.499.
Bernard, 1897, p.31, pl.2, fig.4; pl.31, fig.13.

Description:

Corallum explanate upto 15 mm. thick; two pieces from a fair sized colony measure 14 x 11 and 7.5 x 5 cm. respectively in greater diameters. Upper surface with a few humpy protuberances.

Calices conspicuous, 0.7 to 0.8 mm. in diameters, with smaller ones intercalated, well cut out from the coenenchyme by a

solid thecal wall. Distance between adjacent ones, one diameter to a millemeter apart. Septa in two cycles, primaries large, the directives being invariably exsert. In a few cases the laterals also project above the thecal wall. Usually the six primaries meet the center of the calyx over a rudimentary columella. Second cycle more or less complete, half as long as the primaries. The edges of the primaries very minutely serrated.

Surface of the coral smooth "being very finely and minutely echinulate never papillose or tuberculate" (Quelch, 1886). Under the lens the surface reticulum displays several minute, thin, low, vertical plates the top of which bear 2 to 3 spinules. Between the plates the pores of the reticulum are visible. Section of the coral shows a lower streaming and an upper thickening layers.

Colour:

Corallum yellowish brown; in section the colour penetrates to half the thickness of the corallum.

Locality:

Mandapam (Palk Bay).

Distribution:

Ceylon; Mandapam; Wednesday Island; Torres Straits; Samoa.

Remarks:

The species is characterised by a smooth encrusting corallum and exsert primary septa. This is not a common species around Mandapam, only a single colony being collected.

Glabro-foveolate ramose Montipora

Montipora digitata (Dana), 1846.

(Pl. IX, fig. 5).

Montipora digitata Bernard, 1897, p.47. (Synonymy).
Crossland, 1952, p.183, pl.26, fig. 1.
Stephenson and Wells, 1956, p.20.

Montipora levis Quelch, 1886, p.172, pl.8, figs. 2, 2a.
Bernard, 1897, p.41, pl.31, fig. 19.

A fair suit of specimens was examined, a generalised description of which follows:

Corallum in tufts of slender, numerously dividing branches. Branches below 1 cm. in thickness, generally between 5 to 7 mm., their top either expanded and 'cocks-comb' shaped or slender and digitiform. Height of clumps 10 to 15 cm. with the lower portions generally dead.

Calices small but conspicuous, 0.35 to 0.5 mm. in diameter, about 1 mm. apart. Septa in two cycles, primaries well developed and extending half to the centre of the calyx. Directives larger. Secondaries smaller, 3 to 4 per calyx.

Surface coenenchyme reticulate and porous. In older colonies the lower part of the main divisions may have a few foveolations. Section of the branch shows a central loose, laminate reticulum and an outer thin much closer reticular layer.

Colour:

Living corallum dull-brown with a greenish tinge.

Localities:

Mandapam (Palk Bay), Krusadai Island, Pulli Island, Manauli Island and Hare Island. Two small specimens from Andaman Islands and another from Tuticorin are also referred to this species.

Distribution:

Gulf of Mannar and Palk Bay around Mandapam; Tuticorin; Andaman Islands; Singapore (Purchon, 1956); Cocos-Keeling Islands; Banda Sea; Low Isles; Solomon Island; Fiji.

Remarks:

The species shows marked variation in the thickness of the branches in different colonies. Specimens with both narrow and expanded tipped branches are present in the collection. A clump with slender, digitiform branches at the top is figured in this work. The species is fairly common around Mandapam, growing chiefly in lagoons of Krusadai Islands, Manauli and Hare Islands. In spite of its present day abundance Gravely (1927) has not reported it from Krusadai Island.

Montipora divaricata Bruggemann, 1879.

Montipora divaricata Bruggemann, 1879, p.377.
Bernard, 1897, p.39, pl.3, fig.4; pl.31, fig. 17.
Stephenson and Wells, 1956, p.20.

Montipora fruticosa Bernard, 1897, p.44, pl.4, fig. 2; pl.32, fig. 2.
Crossland, 1952, p.184, pl.33, fig. 2.

Montipora ramosa Bernard, 1897, p.49, pl.5, figs. 1, 2, 3; pl.32, fig. 3.
Vaughan, 1918, p.150, pl.62, figs. 1, 1a, 2, 3.
Umbgrove, 1939, p.55.
Crossland, 1952, p.184, pl.26, fig. 3, 4; pl.27, fig. 3.

Montipora indentata Bernard, 1897, p.65, pl.5, fig. 5; pl.32, fig. 5.

Montipora fossae Crossland, 1952, p.186, pl.26, fig. 2.

This highly variable species is fairly common in all localities around Mandapam. The species treatment adopted here is that of Stephenson and Wells (1956). The present collection includes specimens matching with the following published figures of earlier workers.

Bernard, 1897, pl.5, figs. 1, 2 and 3 (Montipora ramosa).
pl.5, fig. 5 (Montipora indentata)
pl.4, fig. 2 (Montipora fruticosa)
Crossland, 1952, pl.26, fig. 2 (Montipora fossae)

Bernard (1897) has given a good description of the species from Rameswaram under the name M. ramosa to which the present author has little to add. The species differs from M. digitata - the only other ramose glabro - foveolate Montipora known from here - in its larger and stouter stems with comparatively larger and more conspicuous calices with better developed septa.

The major variations observed in this species are in the degree of foveolation, length and thickness of branches and size and depth of calices. Generally, specimens growing in deeper waters show more arborescent corallum with larger calices. A few colonies collected from the seaward side of the reef at Mandapam (Palk Bay) were upto 30 cm. in height. The calices of these specimens are generally 1 mm. in diameter with 2 cycles of well developed septa. Specimens collected from the shallow lagoon waters of Krusadai, Pulli and Manauli Islands were tufted and thicker stemmed with calices ranging between 0.5 to 0.75 mm.

Colour:

Living coral generally dull-brown or grayish green. A few specimens obtained from Palk Bay, however, were coffee-coloured.

Localities:

Mandapam (Palk Bay), Krusadai Island, Pulli Island, Manauli Island, Hare Island. A fairly common species in the lagoon near the shore.

Distribution:

Rodriguez; Gulf of Mannar and Palk Bay around Mandapam; Singapore (Purchon, 1956); Cocos-Keeling Islands; Banda Sea; Taiwan (Kawaguti, 1953); Great Barrier Reef; Low Isles; Palau Islands (Eguchi, 1938), Fiji.

Foveolate Montipora

Montipora turgescens Bernard, 1897.

(Pl. IX, fig. 6; Pl. X, fig. 1).

Montipora turgescens Bernard, 1897, p. 53, pl. 6, fig. 2; pl. 32, fig. 11.

Vaughan, 1918, p. 151, pl. 62, figs. 4, 4a.

Wells, 1954, p. 435, pl. 142, figs. 4, 5.

Stephenson and Wells, 1956, p. 23.

Description:

Corallum encrusting, about 20 cm. in greater spread, maximum thickness 10 mm., edges thin followed by an epitheca.

Calices small, 0.5 to 0.6 mm. in diameter, as deep open holes; surrounded by a solid thecal wall, adjacent calices about a mm. apart. Septa in 2 cycles, primaries large and extending half to two-third the radius of the calyx; secondaries reaching half the length of the primaries; 3 to 6 in different calices.

Interstitial coenenchyme swells up around the calices to form ramparts. In details the surface coenenchyme shows a reticulum with minute echinulations and definite costal striations around the thecal wall.

Section of the coral shows a lower solid, a middle streaming and an upper trabucular layers.

Colour:

Corallum yellowish brown.

Locality:

Manauli Island.

Distribution:

Previously known from Murray Island; Great Barrier Reef; Marshall Islands. Now Manauli Island.

Remarks:

This is not a common species around Mandapam, only a single colony being collected. This is the first record of the species from the Indian Ocean.

Montipora manauliensis sp. nov.

(Pl. X, figs. 2, 3).

Description of the holotype:

Corallum massive, heavy, 35 cm. in greater diameter and 25 cm. in total height (measured in the field). Not realising the importance of the specimen at the time of collection it was broken up and only a piece 17 cm. in diameter and 19 cm. in height was brought to the laboratory. The surface of the coral rises into irregular hillocks of different size and shape as in some species of Porites. The hillocks are 3 to 5 cm. in width and height.

Calices minute, inconspicuous, like mere pin-points, irregular in outline, rounded or elongated, not well bounded by a solid thecal wall. Calices at the upper part of the corallum close together, 0.35 to 0.6 mm. in diameter; still smaller at the basal part where majority are slit-like and are 0.25 to 0.35 mm. in greater diameter and are 1 to 2 mm. apart. They are flush with the surface at the basal part of the corallum, but deeper at the top. Septa in two cycles. Primaries large, either

the directives alone or all the six primaries meet at the centre of the calyx, sometimes over a rudimentary columella. Secondary septa 4 to 6 in numbers. Septa much thickened and crowded within the calyx almost filling the fossa.

The coenenchymal surface swells up around the calyx. The foveolation is more marked on the gibbosities than at the basal part of the corallum. An examination of the surface coenenchyme under the lens reveals a fine reticulum with crowded, vertical plates the edges of which bear 2 to 3 sharp spinules; between which the pores of the reticulum are seen.

Section of the coral appears dense and massive to the naked eye but a close examination under the lens reveals a very thick reticulum of compact, horizontal and vertical elements.

Colour:

The living corallum somewhat lilac.

Locality:

Manauli Island.

Remarks:

Among the known, species of foveolate Montipora, M. socialis, M. profunda,(the latter a probable synonym of M. turgescens) M. foveolata (Dana) are said to have massive corallum. But the calicular and the septal characters of all the above species are quite unlike the present. M. manauliensis sp. nov. is characterised by a massive corallum with gibbosities, minute inconspicuous calices with well developed septa and

foveolate coenenchyme. The species is named after the locality from where the type is collected.

Papillate Montipora

(a) Papilla irregular

Montipora elschneri Vaughan, 1918.

(Pl. X, fig. 4).

Montipora elschneri Vaughan, 1918, p. 154, pl. 64, figs. 1, 1a.
Hoffmeister, 1925, p. 51.
Wells, 1954, p. 435, pl. 144, figs. 1, 2.

Description:

Corallum encrusting, plate-like, 24 cm. in greater diameter. Maximum thickness at the central part 2 cm.; edges only 5 to 6 mm. thick. Surface uneven due to the presence of small protuberances.

Calices 0.6 to 0.73 mm. in diameter, close together or rather wide apart; well cut out from the surrounding coenenchyme by a solid thecal wall. Primary septa large, the directives alone or all the six primaries meet at the centre over a rudimentary columella. Secondary septa smaller, 3 to 4 in numbers, rarely the cycle is complete.

The calices, to put it in the words of Vaughan, "present three conditions in their relation to the coenenchymal surface. The intervening coenenchymal surface may be flat, when the distance between the calices is from 0.5 mm. in depressions to 1.5 mm. on areas which are not depressed. In some areas, which

are relatively small, the coenenchyma rised beyond the calicular rims and produces foveolate calices. In other areas the coenenchyma forms papillae between the calices". Papillae vary from 1.5 to 2 mm. in their basal thickness, about 1 mm. in height; generally remaining single filling the intercalicular area or ocasionally they may fuse to form low ridges. The upward growth of the surrounding coenenchyme may result in occasional rising up of the calicular rim.

Surface coenenchyme reticulate with delicate spinulations. Corallum shows a loose reticular in section.

Locality:

The single specimen in the collection was obtained from the northern side of Hare Island.

Distribution:

Previously known from Fanning Island, Marshall Islands and Samoa. The present record extends its distribution to Gulf of Mannar.

Remarks:

The species is rare around Mandapam. This is the first record of the species from the Indian ocean.

Montipora monasteriata (Forskål), 1775.

(Pl. X, fig. 5).

Montipora monasteriata Crossland, 1941, p. 34, pl. 6.

(3 figures not numbered).

The identification of this species is based on Crossland's description and figures of Forskål's types in the Zoological

Museum of Copenhagen. The coral was noticed to be fairly common at the protected side of the granite-wall of the dockyard at Mandapam, from where a fair suit of samples was collected.

Description:

Corallum grows as crust over crust thus appearing massive, with irregular hummocks at the top. Larger colonies 30 to 40 cm. in greater diameter. Besides the usual hummocks, numerous, slender, short branches with a central worm tube are also seen. Gravier (1911) has also noticed the presence of such branches in his Dijbouti specimens. Crossland (1941) has expressed doubt on the nature of these branches, as to whether they are "an innate character or merely result of parasitisation". In the present specimens all such branches were invariably found to have such worms.

Calices 0.5 to 0.8 mm. in diameter, here much crowded and almost touching, there wide apart to a diameter or so. A well bounded thecal wall is generally absent. The number of septa and the degree of their development display marked variations in different parts of the same colony and in different coralla. Generally the first cycle of septa is well developed with pronounced directives that may meet deep down in the calyx. Secondaries smaller, 3 to 6 in numbers in different calices.

The coenenchyme may be smooth for a considerable area especially at the peripheral part of the colony, or may produce foveolate calices. Crossland has given the following description of the papillae; "we may divide the papillae into the following

four types: (1) ridges between and around the calices rising into low blunt points here and there, (2) thin and pointed processess; the thinnest very delicate ones are round, but as soon as they thickened they flatten. Often sparse, not nearly so many as there are calices, (3) these become numerous and blunt ended, i.e. tongue shaped, but they are never lanceolate, i.e. thinner below, (4) these may fuse forming short plates, the fusion complete to the top of the plate or extending only three quarters of the way up".

Larger flattened and thickened individual papilla vary from 1 to 1.5 mm. in width and height. The pointed ones are smaller, 0.5 to 1 mm. in height and thickness.

The surface coenenchyme under the lens reveals a highly porous reticulum. Section shows a thickening layer resting on an epitheca.

Colour:

Living coral greenish grey.

Locality:

Mandapam (Gulf of Mannar).

Distribution:

Red Sea (Marenzeller, 1906); Western Indian ocean (Gravier, 1911); Mandapam.

Montipora venosa (Ehrenberg), 1834.

(Pl. X, fig. 6).

Porites venosa Ehrenberg, 1834, p. 118.

· Montipora venosa Bernard, 1897, p. 69, pl. 32 , fig. 15.
Vaughan, 1918, p. 153, pl. 63, fig. 3.
Hoffmeister, 1925, p. 50, pl.6, figs. 2a, 2b.
Crossland, 1952, p. 188, pl. 26, fig. 5;
pl. 27, fig. 5; pl. 28, fig. 7.
Wells, 1954, p. 436.
Stephenson and Wells, 1956, p. 23.

Description:

Corallum grows layer over layer in the form of thick plates, the topmost being about 1.5 cm. thick with hummocks at the upper surface. Edges wherever free, bear small calices at the under side. An epitheca follows the growing edge.

Calices on the upper surface of the corallum 0.7 to 0.85 mm. in diameter, rarely more than that; well cut out by a thecal wall from the surrounding coenenchyme; adjacent ones average a mm. apart. Septa in 2 cycles, primaries large and frequently meeting in the centre over a columella, secondaries smaller, 4 to 6 in numbers.

Surface coenenchyme is both foveolate and papillate. A marked feature of the present specimen is the paucity of free papillae. Papillae generally run together to form small ridges with valleys enclosing calices, or may encircle individual calices, with the result the calices appear deep seated in funnel-shaped pits. Four to six, usually five, papillae constitute a rampart around a calyx, their top remaining free. Top of ridges thin, base 1.5 to 2 mm. thick, about so much in height.

Surface coenenchyme highly reticulate with numerous spinulations. Section of the coral shows a rather loose reticular layer with both upwardly and downwardly directed elements.

Locality:

Krusadai Island. Not a common species.

Distribution:

Red Sea; Gulf of Mannar; Taiwan (Kawaguti, 1953); Murray Island; Amboina; Low Isles; Bikini Atoll; Eniwetok Atoll; Samoa.

Montipora spumosa (Lamarck), 1816.

(Pl.XI, fig. 1).

Porites spumosa	Lamarck, 1816, 2nd ed., p. 273.
Montipora spumosa	Bernard, 1897, p. 71, pl. 8, fig. 1; pl. 11; pl. 32, fig. 16.
	Vaughan, 1918, p. 164, pl. 63, figs. 2, 2a.
	Wells, 1950, p. 41.
	Stephenson and Wells, 1956, p. 23.

Description:

Corallum initially encrusting over a colony of Acropora surculosa. Greater basal diameter of the colony 30 cm. with a total height of 16 cm. Upper surface rises into thick, irregular hillocks all of which fused together into a solid mass. A notable feature of this specimen is the presence of several slender digitiform branches 3 to 4 cm. long and about 1 cm. thick, all invariably with central worm tube. The surface of the coral is full of small knobs or protuberances bearing calices. Free edges of the corallum possess small calices at the under side.

Calices conspicuous, but not well bounded by a solid thecal wall; 0.6 to 0.8 mm. in diameter, average 0.75mm.; a diameter to a millimeter apart. Primary septa well developed, directives sometimes fuse at the centre of the calyx. Secondaries of varying numbers, cycle rarely complete.

The peripheral part of the colony is smooth with occasional calicle bearing knobs. On the top of the corallum, especially on knobs, papillae become fairly common. Individual papilla small round-topped or pointed, about a mm. in thickness occupying the entire intercalicular area. The space between the calicle bearing knobs is often glabrous without any foveolation or papilla. Under the lens the smooth surface of the coral reveals a "coarse, flaky, reticulum, the flakes standing up, twisted and with jaggered edges". Section of the expanding base shows a loose reticulum.

A second specimen is encrusting about 25 cm. in greater spread with few gibbosities that are not fused into a solid mass as in the previous.

Colour:

Living corallum yellowish brown.

Localities:

Manauli Island, Mandapam (Palk Bay).

Distribution:

Gulf of Mannar and Palk Bay around Mandapam; Cocos-Keeling Islands; Tongatabu; Low Isles; Lacepede Island.

Montipora edwardsi Bernard, 1897.

(Pl. XI, fig. 2).

Montipora edwardsi Bernard, 1897, p. 78, pl. 8, fig. 3;
pl. 33, fig. 14.

Description:

A large colony 45 cm. in greater diameter and 30 cm. in height is assigned to this species. Only a part 26 x 20 cm. at the top with a height of 18 cm. is preserved.

Corallum somewhat massive, composed of several vertical columns arranged in tiers one above the other. The top of columns almost fuse with each other to form a level plat-form from where the next tier of columns arises. Individual columns narrow and rounded at the base, 1 to 1.5 cm. thick, expanding to 4 to 5 cm. at the top, with a total height of 4 to 6 cm; those of the topmost tier being only 2 to 3 cm. in height. In the present specimen upto 4 tiers of columns can be recognised. The top of the colony bear numerous digitiform or irregular projections, which may later develop into columns.

The calices on the sides and top of columns present different appearances. On the sides of the columns they are small, 0.35 to 0.45 mm. in diameter, flush with the surface, irregular in outline, about a mm. apart. Calices on the top of columns are larger, 0.6 to 0.75 mm. in diameter, less differentiated from the surrounding coenenchyme, close together. Primary septa very prominent, with a bit thickened upper directive which often projects slightly above the thecal wall. Secondaries of varying numbers, the cycle rarely complete. In calices on the

sides of the column, the septa appear crowded, filling the fossa, whereas on the top of columns they are more apart, probably due to the larger size of the calices.

The coenenchymal ornamentation is of special interest. The side of column is devoid of any papilla and is smooth with occasional foveolations. On the top of columns papillae are well developed "as if squeezed out from the narrow interstices between the calices". Individual papillae 1 to 2 mm. thick at the base, about so much in height. A few of them sometimes fuse to form low ridges around the calices.

Smooth areas of corallum is covered completely with very minute echinulations. Papillae highly frosted. Longitudinal section of column shows a thick reticulum. In spite of its apparently large size the coral is very light.

Colour:

Corallum dull-green in living condition.

Locality:

Mandapam (Palk Bay).

Distribution:

Red Sea; Mandapam (Palk Bay); Formosa (Kawaguti, 1953).

Remarks:

According to Bernard M. edwardsi "differs from all the rest in the fact that the papillae confined to the fused tops of the column". This is one of the easily recognisable members of the genus, by virtue of its unique growth-form.

(b) Papillae nipple-shaped.

Montipora verrucosa (Lamarck), 1816.

(Pl. XI, fig. 3).

Porites verrucosa Lamarck, 1816, p. 271.

Montipora verrucosa Bernard, 1897, p. 103, pl. 19, fig. 2.
Studer, 1901, p. 417.
Vaughan, 1907, p. 116, pls. 53 to 59.
Gravier, 1911, p. 88, pl. 12, fig. 53.
Vaughan, 1918, p. 156.
Edmondson, 1929, p. 31, pl. 2, fig. E.
Crossland, 1952, p. 193.
Wells, 1954, p. 438, pl. 143, figs. 6, 7; pl. 147, fig. 3.

Description:

Corallum encrusting as layer over layer, living layer 5 to 8 mm. thick. From the top there arise a few thick, stunted digitiform branches, 6 to 8 cm. long and upto 2 cm. thick, which undergo coalescence among themselves.

Calices 0.7 to 0.85 mm. in diameter, shallow, well cut out from the surrounding coenenchyme by a solid thecal wall; close together. Primary septa large and subequal, usually meet in the centre over a columella. Secondaries smaller, 3 to 4 in numbers, sometimes scarcely recognisable.

Papillae regularly nipple-shaped and occupy the entire interstices, 1 to 1.5 mm. thick at the base, about 1.5 mm. in height. On the branches occasionally 2 to 3 of them may run together to form low ridges.

Surface coenenchyme reticulate with minute echinulations. Section of the encrusting base shows a closely arranged upwardly directed streaming layer sometimes resting on an epitheca.

Colour:

Living corallum yellowish brown.

Locality:

Mana uli Island. From a dead platform of Echinopora lamellosa. Not a common species.

Distribution:

? Red Sea; Somaliland; Madagascar (Pichon, 1964); Gulf of Mannar; Great Barrier Reef; Murray Island; Marshall Islands; Fanning Island; Fiji; Hawaii.

Tuberculate Montipora

Montipora verrilli Vaughan, 1907.

(Pl. XI, fig. 5).

Montipora verrilli Vaughan, 1907, p. 168, pl. 63, figs. 2, 2a, 2b; pl. 64, figs. 1, 1a.

Vaughan, 1918, p. 158.

Hoffmeister, 1925, p. 53, pl. 7, figs.3, 3a.

Wells, 1954, p. 438, pl. 145, figs. 3, 5; pl. 148, figs. 1, 2; pl. 179, figs. 4.

The species is fairly common around Mandapam. A fair suit of specimens belonging to the species is examined both in the field and in the laboratory. A generalised description of the species from here follows.

Corallum encrusting, larger colonies 15 to 20 cm. in greater spread, 1 to 2 cm. thick at the central part. Edges thin, closely adhering to the substratum. Upper surface irregular due to small protuberances. A thick epitheca is usually present at the growing edge.

Calices on the upper part of the corallum either level or elevated to 1 to 2 mm. Larger calices are 0.75 to 0.85 mm. in diameter, but a few are only 0.5 mm.; a diameter to 2 diameters apart. Septa in 2 cycles, primaries well developed with prominent directives which in some cases meeting deep down in the centre of the calyx. Secondary septa small, cycle composed of varying numbers.

Well developed tubercles are in close association with the calyx. There are 4 to 8 tubercles around a calyx, usually 5 or 6. They remain either independant of each other or their basal part may fuse. The fusion of the tubercles causes elevation of the calicular opening. Large tubercle about 1 mm. in height with a rounded top. The entire interstitial coenenchyme is covered by numerous, very small, highly branched spinules which give a rough appearance to the surface.

Surface reticulum moderately porous. Section shows a trabecular layer with both vertical and horizontal bars.

Colour:

Usually yellowish brown but sometimes with pinkish patches.

Localities:

Mandapam (Palk Bay); Krusadai Island, Pulli Island, Manauli Island and Hare Island.

Distribution:

Previously known from Hawaiian Islands; Samoa; Fanning Island and Marshall Islands. The present record extends its distribution to Palk Bay and Gulf of Mannar around Mandapam.

Remarks:

The species is very near to M. ehrenbergii Verrill. According to Wells (1954) M. ehrenbergii is distinguished from M. verrilli "by the slender hispid tubercles and coarse very porous interstitial coenenchyme". It is the first record of this species from the Indian Ocean.

Montipora informis Bernard, 1897.

(Pl. XI, fig. 4).

Montipora informis Bernard, 1897, p. 133, pl. 27, fig. 2; pl. 34, fig. 3.
Vaughan, 1918, p. 156, pl. 64, figs. 3, 4, 4a, 4b, 4c.
Crossland, 1952, p. 195.
Stephenson and Wells, 1956, p. 22.

The species is not uncommon around Mandapam, but it is nowhere so common as it is at the protected side of the granite wall of the dock-yard at Mandapam; where it grows mixed with M. monasteriata. The largest colony measured was 45 cm. in greater diameter.

Description:

Corallum initially encrusting with an explanate base.

The upper surface gives rise to irregularly anastomosing branches upto 15 cm. long and 3 cm. thick, but majority are shorter and thinner. The branches generally enclose a central worm tube.

Calices average 0.75 mm. in diameter, close together or upto 2 mm. apart; well differentiated by a thecal wall which is often hidden from view by the surrounding tubercles. Calices level or slightly projecting. Septa in two cycles, primaries large and often meeting at the centre of the calyx over a rudimentary columella; secondary septa smaller, but the cycle is generally complete. Rarely upto 14 septa could be seen in some calices.

Tubercles around the calices slender, frosted, 1 to 2 mm. in height. There are six to eight tubercles around a calyx, their lower part fusing to form a wall around the calyx. Interstitial tubercles are seen when corallites are wide apart, but they are smaller.

Cross section of the branch shows a central hollow space (representing the worm tube) bounded by a thin solid layer outer to which is present the usual thickening trabecular layer.

Colour:

Corallum greenish brown in living condition.

Localities:

Mandapam (both Palk Bay and Gulf of Mannar), Krusadai Island, Manauli Island and Hare Island.

Distribution:

Madagascar (Pichon, 1964); Gulf of Mannar and Palk Bay

around Mandapam; Cocos-Keeling Islands; Low Isles; Taiwan; Haza-Zima (Ma, 1937); Murray Island.

Montipora composita Crossland, 1952.

(Pl. XI, fig. 6).

Montipora composita Crossland, 1952, p. 195, pl. 28, figs. 1, 5; pl. 29, figs. 1, 3, 4.

Wells, 1954, p. 439, pl. 148, figs. 4, 5; pl. 150, figs. 1, 2, 3.

Description:

Corallum composed of large horizontal fronds, arranged one above the other. Two fronds, from a large colony 60 cm. in greater diameter, measure 35 x 24 and 44 x 33 cm. respectively in their greater diameters. Edges of fronds 2 to 3 mm. thick but they are upto 10 mm. at the central part. Under side of frond smooth and devoid of any calices, except at the extreme growing edge where a few small calices are seen. Major part of the frond at its lower part is dead and infested with encrusting bryozoans; upper side with several small protuberances.

Calices 0.7 to 0.8 mm. in diameter rarely upto 1 mm. They are crowded, level or slightly projecting, less than a diameter apart. Primary septa well developed, only the directives, or all the six meet deep down in the fossa over a rudimentary columella. Secondary septa small, of varying numbers, cycle sometimes complete.

Tubercles slender, tongue-shaped, 1 to 1.5 mm. or slightly more in height, groups of them are found on warty prominences at

irregular intervals all over the corallum. Tubercles on the level regions i.e. between the warts are comparatively smaller. 6 to 8 tubercles surround a calyx, their basal part fusing to form a raised wall around the calyx, leaving their top free.

Transverse section of the corallum shows a lower thick porous streaming layer resting on an epitheca, and an upper trabecular layer with vertical and horizontal bars. The horizontal bars rise above the surface as tubercles.

Two other small colonies 15 and 20 cm. in greater diameters have smaller tubercles. Further the wart formation in these specimens are not so conspicuous as in the previous one.

Colour:

The large colony was greenish-brown in living condition. The younger coralla were white with blue polyps expanded during day time.

Locality:

Mandapam (Palk Bay).

Distribution:

Mandapam (Palk Bay); Great Barrier Reef; Marshall Islands.

Remarks:

The large frondose corallum with numerous small warts on the upper surface of the fronds bearing crowded large, slender, tubercles, is a marked feature of the species. This is the first record of the species from the Indian Ocean.

Montipora foliosa (Pallas), 1766.

Madrepora foliosa (Part) Pallas, 1766, p. 333.

Montipora foliosa Bernard, 1897, p. 158, pl. 30; pl. 34, fig. 13.

Gravier, 1911, p. 85, pl. 12, figs. 51, 52.

Vaughan, 1918, p. 159, pl. 65, figs. 2, 2a, 2b.

Thiel, 1932, p.115, pl. 20, fig. 3.

Umbgrove, 1939, p. 55.

Wells, 1950, p. 42.

Crossland, 1952, p. 194.

Stephenson and Wells, 1956, p. 22.

The occurrence and abundance of this foliaceous tuberculate Montipora around Mandapam has already been recorded by both Bernard (1897) and Gravely (1927). The species is abundant, especially at Krusadai Island and Manauli Island where it cuts large platforms 1 to 2 meters in diameter.

The species warrants no further description, for it has already been thoroughly described by various workers from different parts of the Indo-Pacific. It may be stated that the fronds show no uniformity in their thickness in different colonies. In a few specimens collected from Pulli Island, the fronds were 5 to 7 mm. in thickness whereas other specimens showed much thinner fronds. Two small specimens collected from the inner side of the granite wall of the dock-yard at Mandapam have horizontal fronds instead of the usual vertical ones.

It appears that the horizontal position of the frogds in these specimens is due to the shallowness of the water from where they were collected (depth about 10 cm. at the time of collection). Normal colonies are seen adjacent in deeper regions.

The polyps are often found to be partly expanded during day time displaying a bluish colour.

Localities:

Mandapam (Palk Bay), Mandapam (Gulf of Mannar), Krusadai Island, Pulli Island, Manauli Island and Hare Island. A small fragment from Andaman Islands is also referred here.

Distribution:

Somaliland; Mauritius; Madagascar (Pichon, 1964); Gulf of Mannar and Palk Bay around Mandapam; Cocos-Keeling Islands; Amboina; Philippines; Banda Sea; Palau Islands (Eguchi, 1938); Taiwan (Kawaguti, 1953); Great Barrier Reef.

Suborder FUNGIINA Verrill, 1865.

This suborder includes three superfamilies, viz. Agariciicae, Fungiicae and Poriticae and are to be separated as follows.

I. Solitary or colonial. Septa fundamentally fenestrate, secondarily laminar and is composed of mostly one fan system of simple trabeculae. Synapticulae simple. Septal margin beaded. -- Agariciicae.

II. Solitary or colonial; septa porous, composed of compound trabeculae; edges strongly dentate. Synapticulae compound. Budding mostly intratentacular.

-- Fungiicae.

III. Colonial; corallites generally close together with very little coenenchyme inbetween. Septa perforate, formed of one fan system of simple trabeculae. Edges of septa dentate. Synapticulae simple. Pali present or absent.

-- Poriticae.

Superfamily AGARICIICAE Gray, 1847.

Family AGARICIIDAE Gray, 1847.

Characters of the family:

Mostly colonial, rarely solitary. Corallite wall absent or present. Septa usually laminar, rarely porous, formed of one fan system of simple trabeculae. Septa often confluent from calyx to calyx. Edges of septa dentate. Columella trabecular, sometimes it is absent. Asexual reproduction mostly by intratentacular budding.

Among the members of the family, the genera, Agaricia, Pavona, Leptoseris and Pachyseris and the subgenus Pavona (Polyastra) are recorded from the seas around India, the last mentioned genus and the subgenus being recorded here for the first time from the coastal waters of India. The genus Agaricia is known to Indian region from a single species viz. A. pondorosa described by Gardiner from Minicoy. Matthai (1924) has recorded Leptoseris fragilis Milne Edwards and Haime, L. hawaiiensis

Vaughan and L. digitata Vaughan from Andaman Islands from a depth of 13 fathoms and more. Both the genera, Agaricia and Leptoseris are not represented in the present collection.

Genus PAVONA Lamarck, 1801.

Pavona Lamarck, 1801, Syst. Anim. Sans. Vert. p. 372 (cited after Vaughan, 1918).

Genotype - Madrepora cristata Ellis and Solander, 1786.

Generic characters:

Corallum encrusting, massive, hydnophoroid or foliaceous with bifacial fronds. Calices without definite circumscribing wall. Septo-costae confluent between adjacent calices. Columella small.

Besides the four species of Pavona described in the present work; Matthai (1924) has recorded P. lata (Dana) and P. praetorta (Dana) from Andaman Islands; thus making a total of six species of this genus so far known to the Indian region.

Synopsis of the characters of the species of Pavona described herein.

I. Corallum a thin attached lamina. Calices 2 to 4 mm. apart. Septo-costae strickingly alternating in size. Columella a single style. -- P. explanulata Lamarck

II. Corallum massive with gibbosities. Calices 2 to 4 mm. in diameter with 30 or more septa. Columella a pointed or twisted style. -- P. maldivensis (Gardiner).

III. Corallum hydnophoroid with low colline enclosing small calices. Septa upto 24 around a calyx. Columella weak.

-- P. varians (Verrill).

IV. Corallum frondose, fronds bifacial, ambulacra flat. Carinae if present, transverse to the series of calyx. Distance between adjacent rows of calices 2 to 3 mm.

-- P. decussata (Dana).

Pavona explanulata (Lamarck), 1816.

(Pl. XII, fig. 1).

Agaricia explanulata Lamarck, 1816, p. 244.

Pavona explanulata Horst, 1922, p. 418, pl. 31, fig. 18.

Durham and Bernard, 1952, p. 42, pl. 2, fig.3.

Part of a corallum obtained from Andaman Islands is assigned to the species; the identification being mainly based on Horst's (loc. cit.) description and figure.

Description:

Corallum encrusting, 42 x 22 mm. in greater spreads with a thickness of 4 to 6 mm. at the broken edge. Under surface devoid of any calyx, but marked by alternately thick and thin costae. Calices on the upper side 2 to 4 mm. apart with flat intercorallite walls. Septo-costae around a calyx vary from 15 to 18; confluent between adjacent calices. They are alternating in size, larger ones thickened and exsert to a millimeter but narrower within the calyx. Edges of septa entire, sides highly spinulose. 7 to 9 larger septa reach the columella.

Columella well defined, in the form of an upright style or a compressed twisted lamina.

Locality:

Andaman Islands.

Distribution:

Red Sea; Madagascar (Pichon, 1964); Ceylon; Chagos; Andaman Islands; Solomon Island; Funafuti; Cocos Island - Chatham Bay (Durham and Bernard).

Pavona maldivensis (Gardiner), 1905.

(Pl. XII, fig. 2).

Siderastrea maldivensis Gardiner, 1905, p. 935, pl. 89, figs. 1, 2, 3.

Pavona maldivensis Gravely, 1927, p. 47.

(part) Matthai, 1948a, p. 182, pl. 7, fig. 26.

(Non) Vaughan, 1918, p. 138, pl. 56, figs. 3, 3a, 3b.

Description:

Corallum massive 20 cm. in greater diameter with a thickness of 7 cm.; upper part dead, living zone being confined to the sides and lower edges of the colony. No protuberances visible in the present specimen.

Calices rounded or oval in outline, 2.5 to 4 mm. in diameter; with flat intercorallite wall 1 to 1.5 mm. thick. Septocostae low, confluent between centres, 30 to 36 around a calyx, rarely upto 40. Larger ones narrow down within the calyx to extend to the columella. Septal edges entire, sides granular.

Columella a vertical style or a broad lamella.

Localities:

Manauli Island, Krusadai Island (Gravely, 1927). A small fragment obtained from Tuticorin also belongs to this species.

Distribution:

Maldives; Krusadai Island; Manauli Island; Tuticorin.

Remarks:

Horst (1922) has referred Siderastrea maldivensis Gardiner to the synonymy of Pavona clavus (Dana). But Wells 1954) has expressed doubt on the validity of Horst's contention. The present specimens agreed with Gardiner's description and figures of his Siderastrea maldivensis. Gardiner's specific name, however, is retained here for the species.

Pavona varians (Verrill), 1864.

Pavonia varians Verrill, 1864, p. 55.

Pavona varians Vaughan, 1907, p. 135, pl. 38, figs. 1, 1a.

(part) Vaughan, 1918, p. 138, pl. 57, figs. 2, 2a, 4, 4a.

Horst, 1922, p. 419, pl. 31, figs. 3, 4.

Yabe, Sugiyama and Eguchi, 1936, p. 57, pl. 58, fig. 6.

Umbgrove, 1939, p. 47.

Matthai, 1948a, pl. 5, figs. 12 to 17; pl. 12, fig. 46.

Matthai, 1948b, pl. 15, fig. 1; pl. 16, figs. 3, 4, 5, and 9, 10.

(part) Crossland, 1952, p. 162, pl. 14, fig. 4.

Durham and Bernard, 1952, p. 43, pl. 3, fig. 15.

Wells, 1954, p. 442, pl. 152, figs. 3, 4.

Nemenzo, 1955, p. 16.

Stephenson and Wells, 1956, p. 24.

Pavona repens Gardiner, 1905, p. 946, pl. 90, figs. 9, 10, 11.

Description:

Corallum hydnophoroid with discontinuous low collines, 2 to 4 mm. in height with acute top. Valleys narrow enclosing 1 to 2 rows of small calices. Distance from centre to centre of calices varies from 1 to 3 mm.; mode 2 mm. Septa continuous from calyx to calyx, alternating in size, 20 to 24 around a calyx, larger ones reaching the columella. About 30 septo-costae per 5 mm. length of colline. Edges of septa entire, sides minutely spinulose.

Columella poorly developed, either a vertical pointed style or a compressed twisted lamina.

Colour:

Living corallum yellow.

Localities:

Mandapam (Palk Bay), Krusadai Island, Chetlat Island, Minicoy.

Distribution:

Northern Red Sea; throughout Indo-Pacific as far east to Tahiti and Hawaii. Durham and Bernard has recently recorded the species from Columbia.

Pavona decussata (Dana), 1846.

(Pl. XII, fig. 3).

Pavonia decussata Dana, 1846, p. 327, pl. 22, fig. 4.

Pavona decussata Hoffmeister, 1925, p. 40, pl. 4, fig. 1.

Yabe, Sugiyama and Eguchi, 1936, p. 56, pl. 39, figs. 4, 5, 6; pl. 41, figs. 1, 2, 3.

Umbgrove, 1939, p. 46.

Nemenzo, 1955, p. 14.

Stephenson and Wells, 1956, p. 24.

Description:

Corallum foliaceous from an encrusting base. Clumps upto 20 cm. in height and 15 cm. in width. "The folio" as remarked by Dana (1846) "are nearly flat, few lobed, and are so aggregated and united transversely by others, so as to form an open cellular clump with subquadrangular spaces among the plates from half an inch to two inches broad. Small nearly circular plates or folia often grow out as processes from the surface of a large plate". (quoted after Matthai, 1924).

Folia 2 to 3 mm. thick at the growing edges, thickened upto 10 mm. towards the base. Carinae wherever developed, transverse to the rows of calices; ambulacra flat with septo-costae continuous over them. Distance between rows of calices varies from 2 to 3 mm. in different clumps. Distance between adjacent calices within a row usually 2 mm. Septo-costae subequal or smaller and larger ones alternating. 11 to 12 septo-costae per 5 mm. length of ambulacra. There are 12 to 16 of them around a well developed calyx. Edges of septa entire with straight or zigzag edges; sides granular.

Columella shows marked variation in the degree of development in different calices. In a few cases it is rudimentary while in other cases, either vertical or compressed and twisted lamina, the latter condition being the rule when the calices are elongated.

Colour:

Corallum yellowish brown in living condition.

Locality:

Manauli Island. Colonies are often seen at the top of Montipora foliosa and Echinopora lamellosa. At one site the species was noted to cover a large rock about 1.5 meters, at a depth of about 50 cm. at low tide.

Distribution:

Red Sea; Somaliland; Manauli Island; Malaysia; Cocos-Keeling Islands; Philippines; Bay of Batavia; Palau Islands; Caroline Islands; Ryuku Island; Sikoku; Low Isles; Fiji; Samoa.

Remarks:

This is the only foliaceous species of Pavona so far known around Mandapam.

Subgenus POLYASTRA Ehrenberg, 1834.

Polyastra Ehrenberg, 1834, p. 106.

Pavona (Polyastra) Wells, 1936, p. 549.

Subgenotype - Polyastra venosa Ehrenberg, 1834.

According to Wells (1936) this subgenus differs from typical Pavona in having well developed corallite walls

"which are solidly fused to each other, and relatively elevated with acute margins".

Pavona (Polyastra) venosa Ehrenberg, 1834.

(Pl. XII, figs. 4, 5, 6).

Polyastra venosa Wells, 1936, p. 550, pl. 9, figs. 4, 5.

Pavona (Polyastra) venosa var. arbuscula. Umbgrove, 1939, p. 48, pl. 15, figs. 1 to 5.

Pavona (Polyastra) venosa Nemenzo, 1955, p. 16, pl. 2, fig. 4.

Description:

Corallum encrusting about 50 cm. in greater spread with tufts of crowded, coalascent, branches at the upper side. Maximum height of branches 27 cm. with the lower part dead; the living zone extending 7 to 8 cm. from top below. Top of branches obtuse, resembling those figured by Umbgrove (loc. cit.) in his Pl. 15, fig. 3; or slender, tapering, with tip bifurcated or trifurcated.

Calices show at least 3 distinct facies viz. (1) of typical Pavona type with little elevated corallite wall; (2) P. (Polyastra) venosa type; (3) P. (Polyastra) obtusata type. Calices on branches with obtuse apex, are upto 4 mm. in diameter with solid, raised up, acute wall; with 4 cycles of septa, the fourth being generally incomplete. In slender and tapering branches, calices small, 1.5 to 2 mm. in diameter with flat intercorallite wall displaying typical Pavona condition. They possess 20 to 24 septa out of which 10 to 12 reach the columella. On the peripheral part of the corallum, calices either remain single or form short series of 4 to 5. Single calices 2.5 to 3.5 mm. in

length, rather deep, with elevated acute solid wall. 30 to 40 septa are present in larger ones which are alternating in size and continuous over the wall. Sides and edges of septa finely granular.

Columella small, a single tubercle.

Locality:

Krusadai Island - lagoon, bottom sandy and rocky. Depth not exceeding 50 cm. at low tide. It is found growing mixed with Montipora digitata and Echinopora lamellosa. Part of the corallum was dead and was found overgrown by the alga Caulerpa peltata.

Distribution:

Bay of Batavia; Philippines; Krusadai Island; (The exact locality of Ehrenberg's type is not known).

Remarks:

It is interesting to note that in the present colony as well as in the case of Umbgrove's specimen, the calices show both Pavona (Polyastra) venosa and P. (Polyastra) obtusata Quelch conditions. It is quite possible that, what Umbgrove has described and figured under the new varietal name arbuscula is only the final form of growth of this species, as is the case in the present specimen. Ehrenberg's holotype of Polyastra venosa is only a small fragment (Wells, 1936).

Genus PACHYSERIS Milne Edwards and Haime, 1849.

Pachyseris Milne Edwards and Haime, 1849, C. r. hebd. seane. Acad. sci., Paris, vol. 29, p. 72.

Genotype - Agaricia rugosa Lamarck, 1801.

Generic characters:

"Corallum foliaceous, folio unifacial, or bifacial, calices in concentric rows between long collines, parellel to margin, centres indistinct, united by columellar laminae or trabecular processes. Walls well developed in collines". (Vaughan and Wells, 1943).

The genus is represented by a single species in the present collection as identified below.

Pachyseris rugosa (Lamarck), 1801.

(Pl. XIII, fig. 1).

Pachyseris rugosa Thiel, 1932, p. 93, pl. 15, figs. 1, 2; pl. 21, figs. 3, 4. (Synonymy).
Yabe, Sugiyama and Eguchi, 1936, p. 63, pl. 39, figs. 1, 2; pl. 43, figs. 1,2,3,5.
Ma, 1937, p. 151, pl. 90, fig. 2.
Eguchi, 1938, p. 370.
Umbgrove, 1939, p. 46.
Wells, 1954, p. 445, pl. 155, figs. 3, 4.
Nemenzo, 1955, p. 20, pl. 4, fig. 2.

Pachyseris torresiana Vaughan, 1918, p. 132, pl. 55, figs. 1, 1a.
Crossland, 1952, p. 164.

Description:

Corallum an attached unifacial plate 15 x 17 mm. in greater diameters with its under side marked by low but alternately large and small costae.

Collines discontinuous, acute, 2 to 3 mm. in height, triangular in profile view; their top 2 to 3 mm. apart genetally 3 mm. Septa continuous over the collines, 18 to 20 per 5 mm. length of colline. They are subequal, rarely with smaller ones interspaced, of uniform width from top to bottom, edges minutely dentate, sides granulose.

Columella composed of a solid lamina which is occasionally interrupted.

Locality:

The single specimen in the present collection was obtained from a limestone brought ashore from Manauli Island.

Distribution:

Western Indian Ocean - Madagascar (Pichon, 1964); Gulf of Mannar; Bay of Batavia; Philippines; Banda Sea; Australia; Caroline Islands; Marshall Islands; Samoa.

Family SIDERASTREIDAE Vaughan and Wells, 1943.

Characters of the family:

Mostly colonial, hermatypic, rarely solitary. Corallite wall synapticulothecate, porous. Septa composed of one fan system of simple or compound trabeculae; more or less porous with lacerate or beaded edges and granulose sides. Synapticulae simple. Columella papillary. Asexual reproduction by intra or extratentacular budding.

Key to the genera of the family siderastreidae described in the present work.

I. Corallum encrusting or massive. Calices subpolygonal with thin wall. Budding extratentacular.

-- Siderastrea.

II. Corallum encrusting or massive. Calices in short series with poorly defined walls. Septa confluent between calices. Budding intratentacular. -- Coscinaraea.

Genus SIDERASTREA de Blainville, 1830.

Siderastrea Duncan, 1885, p. 134.

Vaughan, 1900, p. 154.

Genotype - Madrepora radians Pallas, 1766.

Generic characters:

Duncan (1885) defined the genus thus:

"Colony massive, convex or plane, dense, incrusting, corallites united by thin and often indistinct walls. Calices subpolygonal, deep, margin rounded, columella small, papillary made up of ascending trabeculae which often fuse here and there into a mass. Septa solid, rather close, thin denticulate, free, often uniting. Two rows of synapticulae close to the wall unite the opposed septal lamellae, and tend to fill up the interseptal loculi near the wall. Septa imperferate. Endothecal dissepements few. Gemmation marginal".

This genus is known previously from the Indo-Pacific from Red Sea; eastern coast of Africa; Mergui Archipelago; Singapore and Indonesia. This is the first record of the genus from the Indian region and the collection includes two species of this genus as identified below.

Synopsis of the characters of the species of Siderastrea described in this work.

I. Calices polygonal or rounded, generally 3 mm. in diameter with 24 to 30 septa. Septa slightly thickened at the top with serrated edges. -- Siderastrea radians (Pallas).

II. Calices polygonal, 5 to 6 mm. in greater length with occasional meanders. Fourth cycle of septa almost complete. Septa not thickened at the wall. Edges of septa with well marked dentation. -- Siderastrea savignyana (Milne Edwards and Haime).

Siderastrea radians (Pallas), 1766.

(Pl. XIII, fig. 2).

Madrepora radians Pallas, 1766, p. 322.

Siderastrea radians Vaughan, 1901, p. 309, pl. 15; pl. 16, fig. 2.
Yonge, 1935, p. 201, pl. 1, figs. 1 to 4.
Almy, Jr., et. al. 1963, p. 148, pl. 7, fig.3.

Description:

Corallum massive generally 15 to 20 cm. in greater spread. Calices polygonal or rounded, 2 to 3 mm. in diameter, rather deep with thin or slightly thickened intercorallite wall. First 3 cycles of septa always complete, sometimes with upto 6 of the fourth cycle; usually 28 to 30 septa in a calyx. Upper part of the septa a bit thickened and horizontal to the plane of the calyx. 12 septa reach the columella others fuse to the sides of the lower cycle. Septa either continuous over the wall or

stop at the middle of the intercorallite wall. Septal edges with 12 to 15 closely set, weak serrations, sides of septa granular. Two rings of sympticulae; the outer being in close approximation to the wall.

Columella weak, papillary with minute granulations.

Colour:

Living corallum brown. Polyps not found expanded during day time.

Localities:

Mandapam (Palk Bay and Gulf of Mannar); Pulli Island. The species is not very common here.

Distribution:

Atlantic Ocean - Tortugas; Bermuda; Jamaica (Goreau, 1959); Indian Ocean - Palk Bay and Gulf of Mannar around Mandapa m; Mergui Archipelago (Duncan, 1889); Singapore (Studer, 1880).

Remarks:

The species is common in the Atlantic. The present specimens, however, agree in every respect to Vaughan's (1901) description and figures of the species.

Siderastrea savignyana (Milne Edwards and Haime), 1850.

(Pl. XIII, fig. 3).

Siderastrea savignyana Vaughan, 1907a, p. 260. (Synonymy).
Gravier, 1911, p. 60.
Horst, 1921, p. 32, pl. 5, fig. 11.
Horst, 1922, p. 423, pl. 31, fig. 10; pl. 32, fig. 2.

12 small colonies are referred to this species; the identification being based on Horst's (1922) description and figures.

Description:

Corallum encrusting, tending to become massive, 2 to 7 cm. in greater diameter. Corallites and calices polygonal, usually penta or hexagonal, shallow with occasional meanders. Larger calices 4 to 5 mm. in length, rarely upto 6 mm.; with a width of 3 to 4 mm. Intercorallite wall thin and acute. Septa in four cycles, the fourth more or less complete with a total of 40 to 46 septa in larger calices. Septa continuous over the wall. 12 septa reach the columella, others fuse with the sides of the lower cycles. Septal edges with 8 to 12 prominent pointed teeth; septal sides granular.

Two rings of synapticulae; the outer one near the wall, inner at the middle length of the larger septa. Columella a solid mass, sometimes projecting as a conical eminence.

Localities:

Mandapam (Palk Bay), Manauli Island, Hare Island and Andaman Islands.

Distribution:

Red Sea; Somaliland; Palk Bay and Gulf of Mannar around Mandapam; Andaman Islands; Aru Island.

Genus COSCINARAEA Milne Edwards and Haime, 1848.

Coscinaraea Milne Edwards and Haime, 1848, p. 496.

Coscinastrea Yabe, Sugiyama and Eguchi, 1936, p. 61.

Genotype - Madrepora monile Forskål, 1775.

Generic characters:

Massive; calices in short series. Centres distinct, wall not projecting. Septa confluent between centres, the higher cycles fusing to the sides of the lower. Synapticulotheca composed of several rings of synapticulae. Columella papillary. Asexual reproduction by intratentacular mono to tristomodaeal budding.

The genus is represented in the present collection by a single species viz. Coscinaraea monile, the only member of the genus known from India.

Coscinaraea monile (Forskål), 1775.

(Pl. XIII, figs. 4, 5).

Madrepora monile Forskal, 1775, p. 133.

Coscinaraea monile Gardiner, 1905, p. 950.
Marenzeller, 1906, p. 90, pl. 24, fig. 83.
Vaughan, 1907a, p. 260, pl. 23, figs. 2, 3; pl. 24, figs. 1, 2, 3.
Gravier, 1911, p. 64.
Horst, 1922, p. 423.
Matthai, 1924, p. 57, pl. 7, fig. 1.
Crossland, 1941, p. 30, pl. 5, (lower figure).

Coscinaraea donnani Gardiner, 1905, p. 950, pl. 90, fig. 12.

Description:

Corallum somewhat massive with thin edges. The largest specimen in the collection is having a greater diameter of 12 cm.

with a maximum height of 6 cm. The under side is marked with alternately thick and thin costae bearing spinulations.

Calices 6 to 8 mm. in diameter about 2 mm. deep, irregularly polygonal in outline; 2 to 4 of them often forming short valleys. Intercorallite wall little developed. Septa in larger calices 40 to 55, confluent between adjacent calices; mambers of the higher cycle fuse to the sides of the lower cycles leaving 12 to 21 septa to reach the columella, generally 14 or 15. Edges of septa with uniform, secondarily frosted, thin but broad teeth. Septal sides smooth to minutely granular.

Axial fossa rounded, deep; 0.75 to 1.25 mm. in diameter. Columella small, with 6 to 8 papilli-form projections. Synapticula discontinuous.

Localities:

Mandapam (Palk Bay), Krusadai Island, Manauli Island and Hare Island. The species is not uncommon here but usually not seen in very shallow waters.

Distribution:

Red Sea; Somaliland; Maldives; Ceylon; Palk Bay and Gulf of Mannar around Mandapam; Mergui Archipelago (Matthai, 1924).

Remarks:

Out of the 7 colonies in the present collection 5 agree with the descriptions of typical monile, while two colonies match with Gardiner's figures of his G. donnani. These latter specimens have comparatively smaller calices without any meanders. Crossland (1941) has left an excellant review of the literature

dealing with the present species, till then, while redescribing Forskal's types. He has also shown that C. donnani Gardiner is identical with C. monile (Forskål), with which the present author agrees.

Superfamily FUNGIICAE Dana, 1846.

Family FUNGIIDAE Dana, 1846.

Characters of the family:

Solitary or colonial, free or fixed, hermatypic or ahermatypic corals with a discoidal, elongated or foliaceous corallum. Septa numerous, generally fenestrate, formed of one fan system of compound trabecula; septal edges serrated or dentate. Synapticula compound. Costae continuous with septa, sometimes broken into spines. Columella trabecular, weak.

The coral fauna of the seas around India also includes the following genera and species of this family that are not represented in the present collection.

Herpolitha limax (Esper). Matthai (1924) has reported the occurrence of this species at Andaman Islands.

Fungiacyathus (Bathyactis) symmetrica (Pourtales). Alcock (1898) has recorded this species from the Coromandal coast from a depth of 920 to 960 fathoms.

F. (Bathyactis) stephana Alcock, 1898. Alcock described this species from the Bay of Bengal from a depth of 678 fathom.

Key to the genera of the family Fungiidae considered herein.

A. Solitary, discoidal, free in adult stage.

I. Wall imperforate, costae with small spines.

-- Cycloseris.

II. Wall perforate. Costae with well developed spines.

-- Fungia

B.

III. Colonial, fixed, foliaceous cupshaped.

-- Podabacia.

Genus CYCLOSERIS Milne Edwards and Haime, 1849.

Cycloseris Milne Edwards and Haime, 1849, C. r. hebd. seanc. Acad. sci. Paris, Vol. 29, p. 72.

Genotype - Fungia cyclolites Lamarck, 1816.

Generic characters:

Corallum solitary, free, cupoloid or discoidal, wall imperforate. Septal edges dentate. Teeth acute. Costae well marked with small granulations.

Boschma (1925) wrote; "As already has been proved sufficiently by Doderlein (1902) and Vaughan (1907) there is no reason to separate Cycloseris as a distinct genus from Fungia". However, later authors like Vaughan and Wells (1943), Wells (1954, 1956 and 1964) and Nemenzo (1955) preferred to regard these two as separate genera. The major difference between the two being the imperforate corallum of Cycloseris against the perforate corallum of Fungia.

The present collection includes only a single species of this genus. The following species are also known among the Indian fauna, from the Andaman seas.

C. distorta (Michelin). Alcock (1893) has recorded this species.

C. fragilis (Alcock), 1893.

C. hexagonalis Milne Edwards and Haime. Gardiner (1909) has recorded this species.

C. mycoides Alcock, 1893.

Cycloseris cyclolites (Lamarck), 1816.

(Pl. XIII, fig. 6).

Fungia cyclolites Boschma, 1925, p. 205, pl. 5, fig. 24; pl. 6, figs. 25 to 48.
Crossland, 1952, p. 153.

Cycloseris cyclolites Nemenzo, 1955, p. 57.
Wells, 1964, p. 110, pl. 1, figs. 1, 2, 3.

Description:

Corallum light, oval in outline, great basal diameter 38 mm., lesser basal diameter 32 mm; height 22 mm. Lower side arched without any perforation. Upper side convex with a small axial fossa. Septa in 6 complete cycles with a few of the seventh. The first two cycles extend to the axial fossa. Edges of septa with small pointed teeth, septal sides with blunt tipped spines arranged in vertical rows. Axial fossa narrow, 16 mm. in length, obstructed by the projecting first and second cycle of septa. Columella papillary.

Costae alternating in size, continuous with the septa with small spines arranged all along their length. At the central part of the disk the fusion of the costae gives the appearance of irregular figures.

Locality:

The single specimen in the present collection was obtained from Tuticorin. The depth at which it was collected is not known.

Distribution:

Red Sea; Ceylon; Tuticorin; Philippines; China Sea; Great Barrier Reef; Queensland; Palau Islands.

Genus FUNGIA Lamarck, 1801.

Fungia Lamarck, 1801, Syst. Anim. sans. Vert., p. 369 (cited after Vaughan, 1905).

Vaughan, 1905, p. 380.

Genotype - Madrepora fungites Linnaeus, 1758.

Generic characters:

Corallum free in adult stage, discoidal or elongated, flat or convex with a central furrow or depression at the calicinal surface. Wall perforate in ephebic stage. Costae reduced to prominent rows of spines. Septa numerous, strongly dentate.

List of Fungia known from the seas around India including Ceylon. Those marked with asterisk (*) are not present in the author's collection.

S.No.	Name of the species	Localities and references
1.	*F. somervillei Gardiner	Andamans (Matthai, 1924).
2.	*F. paumotensis Stutchbury.	Andamans (Matthai, 1924).
3.	F. scutaria Lamarck	Minicoy, Ceylon (Gardiner, 1905 and Bourne, 1905).

4.	F. echinata (Pallas)	Ceylon, Andamans (Gardiner, 1909; Matthai, 1924).
5.	*F. simplex (Gardiner)	Andamans, Matthai (1924).
6.	*F. concinna Verrill	Andamans, Matthai (1924).
7.	F. horrida Dana	Andamans, Matthai (1924)
8.	*F. subrebanda Doderlein	Andamans, Matthai (1924).
9.	*F. danai Milne Edwards and Haime	Ceylon, Minicoy (Bourne, 1905; Gardiner, 1909).
10.	*F. corona Doderlein	Andamans, Matthai (1924).
11.	F. fungites (Linnaeus)	Minicoy, Andamans (Gardiner, 1905; Matthai, 1924).

Fungia echinata (Pallas), 1766.

Madrepora echinata Pallas, 1766, p. 284.

Fungia echinata Studer, 1901, p. 405.

Vaughan, 1907, p. 134, pl. 36; pl. 37.

Matthai, 1924, p. 42, pl. 8, fig. 2; pl. 9, fig. 4; pl. 10, fig. 8.

Boschma, 1925, p. 215, pl. 7, figs. 66, 67, 71, 72; pl. 10, fig. 126.

Thiel, 1932, p. 67, pl. 10, fig. 1.

Ma, 1937, pl. 68, figs. 1, 2; pl. 69, figs.1, 2.

Crossland, 1952, p. 152.

Wells, 1954, p. 448.

Nemenzo, 1955, p. 89, pl. 10, figs. 3, 4.

Description:

Corallum longer than broad, length 20 cm., width at mid-length 7.5 cm. It is almost a flat disk with a maximum thickness of 3.5 cm. as it is resting on a table. Axial furrow extends

almost the entire length of the disk. Septa close together, 14 or 15 per centimeter length of the disk at its edge. 3 to 5 smaller septa are found between every two larger septa. Septal edges dentate, teeth of the major septa large, about 1 mm. in height, getting larger towards the axial fossa; and are about 2 mm. apart.

The non-calicinal side is rendered rough by the costal spines, between which the disk is perforated. An attachment scar is visible at the centre of the disk at the lower side. Spines on costae low, slender and secondarily frosted. A few concentric grooves which mark the lines of growth (Matthai 1924) are visible at the lower side of the corallum.

Locality:

Andaman Islands. A single specimen.

Distribution:

Red Sea; Somaliland; Ceylon; Andaman Islands; Mergui Archipelago; Singapore; Banda Sea; Philippines; Amboina; Great Barrier Reef; Palau Islands; Marshall Islands; Hawaii; Tahiti.

Remarks:

This is one of the easily recognisable members of the genus by virtue of its flat-corallum and uniform sized small septal dentitions.

Fungia scutaria Lamarck, 1801.

(Pl. XIV, fig. 1).

Fungia scutaria Gardiner, 1909, p. 272, pl. 34, fig. 8. (Synonymy).

Vaughan, 1918, p. 128.

Horst, 1921, p. 9.

Boschma, 1925, p. 215.

Thiel, 1932, p. 63.

Ma, 1937, pl. 46, figs. 1, 2; pl. 47, figs. 1 to 4; pl. 48, figs. 3, 4.

Umbgrove, 1939, p. 43.

Wells, 1950, p. 44.

Wells, 1954, p. 447, pl. 95, fig. 1.

Nemenzo, 1955, p. 61, pl. 11, fig. 5a.

Eight specimens, with details of measurement and septal numbers, as tabulated in Table V, are examined.

TABLE V

Details of measurements and septal numbers of specimens of *F. scutaria* examined.

S. No.	Greater diameter at the base, in cm.	Lesser diameter at the base, in cm.	Height in cm.	Length of axial fossa in cm.	Depth of axial fossa in cm.	Total number of septa.
1.	10.8	9.5	6.5	3 + 3 + 2.5	1.6	460
2.	12.0	8.5	4.2	6.5	2.0	430
3.	10.4	8.2	4.4	2.5	1.2	368
4.	9.1	7.9	2.0	3.5	1.2	374
5.	8.1	6.1	3.8	4.0	1.4	326
6.	7.9	5.6	3.4	3.7	1.3	324
7.	7.0	5.5	1.8	2.0	1.0	285
8.	12.5	9.5	3.5	4.2	1.6	578

The non-calicinal side of all the specimens, except 4 and 7

(numbers refer to their number in the table V) are arched, whereas 4 and 7 are almost flat disks. Septa thin, wavy, with prominent tentacular lobes, and small uniform microspic dentation at their edges. There are 30 to 40 teeth per centimeter length of septa. Septal faces finely granular.

An attachment scar is visible in all specimens except in No. 1. Perforations on the under side become more numerous towards the peripheral part of the disk than at its central part. Costal spines small, conical in outline, smooth or with minute granulations. Larger spines nearly 1 mm. in height. Spines larger towards the peripheral part of the disk.

Locality:

Chetlat Island (Nos. 1 to 7), Minicoy (No. 8).

Distribution:

Red Sea; Maldives; Laccadives; Ceylon (Bourne, 1905); Madagascar (Pichon, 1964); Singapore; Cocos-Keeling Islands; Banda Sea; Philippines; Palau Islands (Eguchi, 1938); Great Barrier Reef; Marshall Islands; Hawaii.

Remarks:

One of the specimens in the collection (No. 1) is of special interest. Unlike in other specimens, the axial fossa in this is trifurcated (Pl. XIV, fig. 1). In other respects this specimen is normal.

Fungia fungites (Linnaeus), 1758.

(Pl. XIV, figs. 2, 3).

Fungia fungites Gardiner, 1905, p. 940. (Synonymy).

Vaughan, 1907a, p. 26.

Gardiner, 1909, p. 279.

Harrison and Poole, 1909, p. 901.

Gravier, 1911, p. 62.

Vaughan, 1918, p. 127.

Horst, 1921, p. 14.

Boschma, 1923a, p. 149, pls. 7 to 15, figs. 1 to 46.

Matthai, 1924, p. 46.

Boschma, 1925, p. 220, pl. 7, fig. 73.

Thiel, 1932, p. 62.

Umbgrove, 1939, p. 44.

Wells, 1950, p. 44.

Crossland, 1952, p. 153.

Wells, 1954, p. 448, pls. 158 to 160.

Nemenzo, 1955, p. 62, pl. 11, fig. 3b.

Stephenson and Wells, 1956, p. 26.

Description:

Four specimens with details of measurement and septal numbers as presented in Table VI are placed under this species.

Specimens 1, 2 and 4 are arched at their lower side, whereas number 3 is almost a flat disk. Specimens 1 and 2 have respectively, 3 and 2 secondary mouths (Boschma, 1925) at their calicular surface, though not fully differentiated. The attachment scar is secondarily lost in all the specimens by the overgrowth of coenenchyme.

TABLE VI

Measurements and septal numbers of specimens of F. fungites examined.

S. No.	Greater diameter of the disk in cm.	Lesser diameter of the disk in cm.	Height in cm.	Length of axial fossa in cm.	Total No. of septa at the edge of the disk.
1.	20.0	18.0	7.0	5.0	665
2.	13.0	12.0	5.0	2.5	445
3.	9.5	8.0	2.5	1.5	378
4.	20.0	17.0	5.0	7.0	704

Edges of septa with uniform teeth about 1 mm. in height, 6 to 7 teeth per centimeter length of septa. Face of septa granular. Under side of the corallum is provided with numerous circular, oval or slit like perforations which are more numerous at the outeredge of the disk. Costae indistinct, represented by rows of prominent sharp spines. The costal spines are large at the centre of the disk; sometimes 2 to 5 of them undergoing fusion at their base. In specimens 1 and 2 larger spines are 3 to 5 mm. in height, in others they are slightly smaller.

Localities:

Chetlat Island (No. 1); Andaman Islands (Nos. 2 and 3); Minicoy (No. 4).

Distribution:

Throughout Indo-Pacific from Red Sea to Tahiti and Samoa. But not known from the reefs around Mandapam.

Fungia horrida Dana, 1846.

(Pl. XIV, fig. 4).

Fungia horrida Dana, 1846, p. 298, pl. 19, fig. 7.

Marenzeller, 1906, p. 89.

Matthai, 1924, p. 44, pl. 9, fig. 2; Pl. 10, fig.6.

Boschma, 1925, p. 220.

Nemenzo, 1955, p. 66, pl. 12, figs. 4, 5.

Description:

Corallum convex with a highly arched under side. Greater basal diameter 9 cm., height 5.5 cm. ; some what conical from top below. Axial fossa small, about 1.5 cm. in length, obstructed by the projecting major septa. Every fourth septa is much pronounced broad and stands 4 to 5 mm. above the level of the intervening subsidiary septa. Septal dentition large, irregular, those of the larger septa 1 to 2 mm. in height and basal thickness, but those of the smaller septa smaller giving a serrated appearance to the septal edges. Columella somewhat spongy.

The perforations at the non-calicinal side are very few and are limited to the extreme periphery of the disk. An attachment scar is visible with a few large spines on it. Costal spines large, 1 to 3 mm. in height with a thickness of 1 mm. at the base. Tip of spines sharp, but sometimes bifurcated with secondary spinulations. Occasionally 3 to 4 of them forms small clusters by the fusion of their basal part.

Locality:

Andaman Islands. A single specimen.

Distribution:

Red Sea; Madagascar (Pichon, 1964); Andaman Islands;

Philippines; Amboina; Fiji.

Remarks:

The presence of very broad major septa with large irregular dentition and peculiar, conspicuous costal spines immediately separate this species from other members of the genus.

Genus PODABACIA Milne Edwards and Haime, 1849.

Podabacia Milne Edwards and Haime, 1849, C. r. hebd. seane. Acad. sci., Paris Vol. 29, p. 71.

Genotype - Madrepora crustacea Pallas, 1766.

Generic characters:-

Colonial, fixed, foliaceous, generally cup-shaped. Calices confined to the inner side of the cup, often arranged around a large central calyx. Non-calicinal side porous, costate.

The genus is represented in the present collection by the well known member of P. crustacea (Pallas).

Podabacia crustacea (Pallas), 1766.

(Pl. XIV, fig. 5).

Madrepora crustacea Pallas, 1776, p. 271.

Podabacia crustacea Studer, 1901, p. 416.

Gardiner, 1905, p. 942, pl. 90, fig. 8.

Horst, 1921, p. 26.

Yabe, Sugiyama and Eguchi, 1936, p. 64, pl. 47, figs. 1 to 6.

Matthai, 1948a, pl. 3, figs. 1, 2, 3; pl. 4, fig. 1.

Crossland, 1952, p. 156, pl. 12, fig. 1; pl. 13, fig. 3.

Nemenzo, 1955, p. 73, pl. 1, fig. 5.

Description:

Two small coralla measure 8 cm. and 5.6 cm. respectively in their greater diameters. Corallum attached, foliaceous with the growing edges slightly turned up in the form of shallow-cup. Edge of the cup 2 to 3 mm. thick. In the larger corallum the central calyx is about 10 mm. in diameter, around which smaller calices are arranged in almost concentric rows; the arrangement loosing its regularity towards the edges of the corallum. Distance between centre to centre of adjacent corallites in a row about 5 mm. Septo-costae alternating in size, the larger ones rising about a mm. at their mid-length and then sloping down on either ends to the calyx. They are less exsert at the peripheral part of the corallum. Edges of septa with very prominent dentition, sides highly granular. Twelve to fifteen, generally twelve septa are visible within a calyx. Columella rudimentary, often a single style.

The underside of the corallum, i.e. the non-calicinal side is provided with small elongated openings. Costae visible towards the periphery with small spines, getting obsolete towards the basal part of the corallum.

Locality:

Minicoy.

Distribution:

Maldives; Minicoy; Ceylon (Ortmann, 1889); Singapore

(Purchon, 1956); Philippines; Ryu Kyu Island; Great Barrier Reef; Samoa.

Superfamily PORITICAE Gray, 1842.

Family PORITIDAE Gray, 1842.

Characters of the family:

Colonial, encrusting, massive, columnar or ramose, hermatypic scleractinians with closely arranged corallites with very little coenosteum between them. Septa as a rule not more than 24; more or less perforated. The innermost septal trabecula forms a palus. Columella a simple trabecula. Colony formation by extratentacular budding.

Out of the three known living genera of this family, only 2 are represented in the present collection. The third viz. Alveopara, though known from Ceylon, is not so far recorded from the coastal waters of India.

Key to the genera of the family Poritidae considered herein:

I. Septa in three cycles -- Goniopora

II. Septa in two cycles -- Porites

Genus GONIOPORA de Blainville, 1830.

Goniopora de Blainville, 1830, Dict. sci. Nat., LX, p. 359. (cited after Vaughan and Wells, 1943).

Genotype - Goniopora pedunculata de Blainville, 1830.

Generic characters:

Corallum encrusting, massive, columnar or rarely ramose. Corallites close together. Septa in 3 cycles. Septa and wall highly porous. Columella usually well developed.

Bernard (1903) has mentioned the occurrence of a single Goniopora at Rameswaram which he has stated to be related to G. columna Dana; and is, however, not represented in the present collection. Gravely (1927), has also noticed the presence of this genus at Krusadai Island but he has made no attempt to identify any species. The present collection includes 4 species of Goniopora, all of which are first record from this area. One of Bernard's earlier described form is found to deserve a new name.

Synopsis of the characters of the species of Goniopora described in the present work.

I. Calicles polygonal or rarely rounded, 4 to 5 mm. in length and depth. Septa obsolete at their top. Columella well developed. Intercorallite wall thin.

-- G. stokesi Milne Edwards and Haime

II. Calices rounded or rarely polygonal, 4 to 5 mm. in diameter; shallow, about 1.5 mm. deep. Septa well developed. Intercorallite wall moderately thickened.

-- G. djiboutiensis Vaughan.

III. Calices irregular in size and shape; larger peripheral ones 4 to 5 mm. in diameter; smaller ones 3 mm. at the top of the colony. Third cycle of septa of varying numbers.

-- G. duofaciata Thiel.

IV. Calices polygonal, or rounded at the top of the corallum; small, about 3 mm. in diameter, uniform in size, flush with the surface, or about 1.5 mm. deep. Edges of septa with uniform dentition. Columella a single style. Coral usually black in colour. -- G. nigra new name.

Goniopora stokesi Milne Edwards and Haime, 1860.

(Pl. XIV, fig. 6).

Goniopora stokesi Vaughan, 1907a, p. 262, pl. 28, figs. 1, 2. (Synonymy).

Gravier, 1911, p. 82, pl. 11, figs. 49, 50.

Gardiner and Waugh, 1939, p. 242.

Nemenzo, 1955, p. 45.

Goniopora maldives (4)[4] Bernard, 1903, p. 89, pl. 7, fig. 6; pl. 13, fig. 9.

Description:

Corallum massive, dome-shaped with thin edges followed by an epitheca. Average sized colonies 10 to 15 cm. in greater diameter.

Corallites polygonal, usually penta or hexagonal; rarely rounded when the intercorallite wall is thickened. Full sized calices 4 to 5 mm. long, 4 to 5 mm. deep; with newly formed ones intercalated. Giant calices upto 8 mm. in length with double the usual number of septa are rarely met with. Intercorallite wall generally very thin and sometimes interrupted, highly porous. Rarely it is thickened upto 1 mm.

Septa 24, arranged in typical Gonioporid fashion; narrow and obsolete at the summit of the wall, broader and better developed below. Septa perforated, edges dentate. Interseptal loculi wider than septa.

Columella composed of concentrically arranged synapticula around the septal ends; almost filling the bottom of the calyx. Pali not prominent.

Locality:

Four colonies were collected from Mandapam (Palk Bay).

Distribution:

Somaliland; Maldives; Mandapam; Jawa Sea; Philippines.

Goniopora diiboutiensis Vaughan, 1907.

(Pl. XV, fig. 1).

Goniopora diiboutiensis Vaughan, 1907a, p. 263, pl. 26; pl. 27, fig. 2.

Description:

A large colony 29 x 15 cm. at the top with a height of 20 cm. represents this species in the collection. The corallum is narrow at the base getting broader above. Major part of it is dead and bored by the bivalve, Lithophaga. The living zone is confined to seven small rounded patches.

Calices generally rounded, rarely polygonal; 4 to 5 mm. in diameter, shallow, 1 to 1.5 mm. deep. Intercorallite wall 0.5 to 1 mm. thick, porous. Septa 24, fairly thickened at the wall; edges with 5 to 7 subequal teeth. Sides of septa spinulose.

Columella tangle well developed, fills more than half the bottom of the calyx; "composed of concentrically arranged synapticula and fused inner ends of the septa", with a few papilliform projections. Pali six, conspicuous in shallow calices; rudimentary in deeper ones.

Locality:

Manauli Island. Found practically lying free.

Distribution:

Somaliland; Manauli Island (Gulf of Mannar).

Remarks:

The species differs from G. stokesi in its shallower calices and better developed and more thickened septa. Further majority of the calices in the present species is rounded with comparatively thicker intercorallite wall.

Goniopora duofaciata Thiel, 1932.

Goniopora duofaciata Thiel, 1932, p. 134, pl. 20, fig. 7.

Nemenzo, 1955, p. 52.

Goniopora. Maldives 2. Bernard, 1903, p. 87, pl. 7, figs. 2, 3; pl. 13, fig. 7.

A generalised description of the species based on a fair suit of specimens examined is as follows.

Corallum cushion-shaped with thin attached edges. An epitheca is generally visible at the growing edge. Colonies vary from 10 to 20 cm. in greater diameter.

Corallites at the edge of the colony polygonal, shallow, 3.5 to 4.5 mm. in length; those at the top of corallum more or less rounded, 2.5 to 3 mm. diameter, 2 to 3 mm. deep. Intercorallite wall thin or thickened upto 1 mm.

Septa in three cycles, the third is of varying numbers, rarely the cycle complete. First two cycles of septa subequal, vertical at first, later broadening to reach the columella. Septal edges with 4 to 6 teeth, the lowest being the largest.

Septal sides generally smooth. Interseptal loculi wider than the septa, sometimes two to three times; due to the dropping out of some members of the third cycle.

Columella moderately developed, one-third to half the width of the calyx; composed of concentrically arranged synapticula around the septal ends. In shallow calices six pali are recognisable, but they are scarcely developed in deeper calices.

Localities:

Mandapam (Palk Bay); Krusadai Island, Manauli Island, Hare Island.

Distribution:

Maldives; Gulf of Mannar and Palk Bay around Mandapam; Banda Sea; Philippines.

Remarks:

This is a fairly common species around Mandapam often found in very shallow regions near the shore. Polyps generally expanded during day time, bluish green in colour with a gray peristome. Fully expanded polyps about a centimeter above the skeleton.

Goniopora nigra new name

(Pl. XV, figs. 2, 3)

Goniopora Great Barrier Reef (15)[14]

(Goniopora Queenslandia quarta decima). Bernard, 1906, p. 153, pl. 8, fig. 5.

The following description is based on a study of several samples collected during the present investigation.

Description:

Corallum primarily encrusting, final growthform pulvinate. Larger colonies 50 cm. or so, in diameter. Living layer 1 to 3 cm. thick in different colonies.

Calices exhibit two distinct facies. The young encrusting as well as the growing edge of the corallum possess neatly polygonal, generally pentagonal calices exactly resembling Bernard's Pl. 8, fig. 5. Larger ones 3 x 3 mm. in size, flush with the surface, with very thin intercorallite wall. On the top of the corallum calices become rounded and smaller, 1.5 to 2 mm. in diameter and 1 to 1.5 mm. deep, with intercorallite wall thickened upto 1 mm.

Septa 24 in numbers. In shallow polygonal calices they are long, straight, appearing as if a "long row of coarse, irregular granules, broad and sometimes appearing doubled near the wall but tapering away to minute single granule near the centre". 6 to 10 such granules (septal teeth) are present along the length of a septa. In deeper and rounded calices septa, narrow, vertically descending at first and then broadening below to reach the columella. The septal teeth in deeper calices are less prominent and irregular in size. Interseptal loculi equal or wider than septa. Septal sides granular.

Columella a single upright style with granulations; joined to the septal ends by radii. Palar formula complete; pali rising slightly above the columella; less prominent in deeper calices.

Colour:

Living corallum exhibit an unbleachable mild, sepia ink-black colour; which extends to half the thickness of the living layer in section.

Localities:

Mandapam (Palk Bay); Manauli Island, Hare Island. A fairly common species here, especially at the Gulf of Mannar side.

Distribution:

Palk Bay and Gulf of Mannar around Mandapam; Queensland.

Remarks:

The species displays bewildering variation in its calicular characters, especially in size and shape. Only two extremes are shown in the accompanying figures. Any worker who has not studied the species in the field and who bases one's conclusions only on fragments, is liable to make two or three 'species' out of it. The present species seems to be a primitive member of the genus. Its relation with some of the fossil forms described and figured by Bernard (1903) from the Paris Basin is at once evident. Bernard has stated that his specimen was "smooth and massive, oval in outline, with both upper and lower surface somewhat flattened". This condition can be due to the fact that his specimen "had rolled over and was free".

The specific name refers to the colour of the corallum.

Genus PORITES Link, 1807.

Porites Link, 1807, Natur. Samml. Rostock, p. 162.

(cited after Bernard, 1905).

Vaughan, 1918, p. 188.

Genotype - Madrepora porites (Part) Pallas, 1766.(= Porites polymorphus Link, 1807).

Generic characters:

Corallum encrusting, massive, or ramose. Corallites small generally within 2 mm. in diameter; close together. Septa 12, arranged as a dorsal directive, four pairs of laterals, and a ventral triplet with or without a trident formation. Pali present. Columella usually a single tubercle.

This is the commonest and most abundant of all coral genera around Mandapam. The abundance of the dead and semifossilised colonies show that this genus was more luxuriant in the past than it is at present. The genus is of much economic importance in this region and tons of dead and living colonies are daily brought ashore, either from Palk Bay or from Gulf of Mannar; depending on the prevailing monsoon. It is transported to distant places, where it is used as building blocks, or in the preparation of lime or other products. It may be this large scale exploitation that resulted in the present day dwindling of the genus on the surface reefs around Mandapam. The most common members of the genus, occurring here are P. solida (Forskål), P. somaliensis Gravier and P. mannarensis new name.

Ten species of Porites are described in this work out of which two of Bernard's Porites are given new names and one is however, described as new to science. Out of the ten species described herein, eight were collected around Mandapam, the other two were obtained from Laccadives.

Besides, those that are dealt with in this work, there are

records of the following species of this genus from this part of the Indian Ocean.

Ridley (1883) has recorded P. echinulata, P. punctata and P. gaimardi from Ceylon. Ortmann (1899) has recorded P. cribripora also from Ceylon. Sewell (1935) recorded P. nodifera from Pamban. Bernard (1905) has described and figured many specimens of Porites from Ceylon and Rameswaram.

Synopsis of the characters of the species of Porites described herein.

A. Corallum massive, surface lobulated.

(a) Laterals of the ventral triplet of septa free without a trident formation.

I. Calices polygonal, 1.5 to 2 mm. in diameter rather deep, wall thin, inner septal denticles large forming a ring, outer to the palar crown.

-- P. solida (Forskål)

II. Calices polygonal, 0.8 to 1.5 mm. in diameter, moderately deep, wall much thickened; septa wedge-shaped with larger pali on the laterals. Columella deep seated. -- P. fragosa Dana.

III. Corallum free; calices polygonal at the top of the corallum, rounded below, about 1 mm. in diameter, moderately deep. Wall not much thickened; septa thin with smooth sides and weak denticles. Pali complete. Colonies have a tendency to grow on the branches of Acropora. -- P. mannarensis new name.

(b) Laterals of the ventral tiplet of septa form a trident.

IV. Calices polygonal, 1 to 1.5 mm. in diameter, shallow; wall thin zigzag or straight, often interrupted with relatively coarse mural denticles.

-- P. lutea Milne Edwards and Haime

V. Calices as in (IV) but the mural denticles and septal teeth more coarse with more thickened and straightened corallite wall.

-- P. somaliensis Gravier.

B. Corallum encrusting with or without gibbosities.

VI. 5 to 8 calices often run together in short series, with little developed intercorallite wall. Septal formula irregular. -- P. lichen Dana

VII. Upper part of the septa vertically exsert. Septal sides smooth. Second cycle of septa sometimes incomplete. -- P. exserta new name.

C. Corallum ramose.

VIII. Branches flabellate, coalascent, calices 1.5 to 2 mm. in diameter, deep and excavated. Pali poorly developed. -- P. compressa Dana.

IX. Corallum with croocked digitiform branches. Calices superficial, septal denticles and pali well developed.

-- P. andrewsi Vaughan.

X. Corallum unattached with radiating small branches with expanding tip, from a central process. Septa thickened at the wall, edges broken into a few granules. Pali weak. -- P. jonesi new species.

Porites solida (Forskål), 1775.

Porites solida Vaughan, 1918, p. 191, pl. 84, figs. 3, 3a. (Synonymy).

Crossland, 1941, p. 21, pls. 1 to 3; pl. 4 (upper figure).

Crossland, 1948, p. 202, pl. 14 (lower figure).

Wells, 1950, p. 45.

Description:

Corallum massive, surface undulate, average sized colonies 30 to 40 cm. in greater diameter.

Calices polygonal fully formed ones 1.5 to 2 mm. in diameter, about 1 mm. deep, with thin and porous intercorallite wall. Mural denticles compressed, frosted, about twice the number of septa. Septa 12, starting from a bit below the summit of the wall. They are arranged in typical poritid manner, the laters of the ventral triplet remaining free of each other without a trident formation. Septal denticles one or two, the outer one near the wall, smaller than the inner; inner denticles plate like arranged in more or less definite ring around the pali. Interseptal loculi wide, sides of septa smooth or minutely granular.

Pali poorly developed, scarcely recognisable in deeper calices. In shallow calices six pali can be made out, one on each directive, and one on each of the fused end of the lateral pairs of septa. The pali on the directive septa usually stand below the level of those of the lateral septa. Outer synapticular ring near the wall, seldom complete; inner, better developed more or less complete.

Columella a compressed upright lamella, joined to the septa by 5 to 6 radii.

The major variations noticed in the present specimens are in the thickness of the intercorallite wall; degree of granulations on septal sides, and in the development of pali.

Colour:

Living corallum greenish-brown or dull green.

Localities:

Hare Island, Manauli Island, Pulli Island, Mandapam (Palk Bay). Two fragments - one from Andaman Islands and another from Tuticorin - are also referred to this species.

Distribution: Maldives (Wells and Davies, 1966); Red Sea; Gulf of Mannar and Palk Bay around Mandapam; Andaman Islands; Cocos-Keeling Islands.

Porites fragosa Dana, 1846.
(Pl. XV, fig. 4).

Porites fragosa Dana, 1846, p. 563, pl. 55, figs. 9, 9a.
Vaughan, 1918, p. 194, pl. 86, figs. 2, 2a.
Wells, 1954, p. 454, pl. 171, fig. 1.

? Porites Ceylon (22)[21] Bernard, 1905, p. 213.

Description:

A massive corallum with lobulated surface has a greater basal diameter of 35 cm. with a total height of 20 cm.

Corallites polygonal, 0.9 to 1.3 mm. in diameter; calices rounded or polygonal; moderately deep with occasional giant ones with double the number of usual septa. Intercorallite wall more thickened at the lower part of the corallum than at the top. Mural denticles coarse, highly frosted. Septa thickened near the wall, wedge-shaped, the ventral triplet do not form a trident. Sides of septa granular. Interseptal loculi narrower than the septa. Septal denticles one or two, when there are two, the outer one is near the wall and is much pronounced; inner one smaller and always stands below the level of the pali. Outer synapticular ring in close relation with the wall, inner ring deep seated.

Palar formula complete, but pali of the lateral pairs of septa very much pronounced. The palus on the directive of the ventral triplet stands a bit outer to those of the laterals of the triplet. Pali secondarily frosted.

Columella a deep seated compressed tubercle joined to the septa by radii.

Locality:

Manauli Island. Not a common species.

Distribution:

Gulf of Mannar; ? Great Barrier Reef; Marshall Islands; Fiji.

Remarks:

Ortmann (1899) has reported a specimen from Ceylon under the present specific name. But Vaughan (1918) while redescribing

Dana's type in the U.S. National Museum, has made no reference to Ortmann's record, and limited the geographic distribution of the species to Fiji.

Porites mannarensis new name.

(Pl. XV, fig. 5).

Porites Ceylon (22)[7]
(P. ceylonica septima). Bernard, 1905, p. 202, pl. 30, fig. 2; pl. 35, fig. 22.

Description:

Corallum globular or subhemispherical, lying practically free. Surface lobulated. In globular specimens invariably the remains of Acropora on which the colony initially started its growth is retained. In others the basal part is expanded. Three globular coralla, 16, 17 and 20 cm. respectively in greater diameter, alongwith part of a hemispherical colony 40 cm. in basal diameter are preserved. The surface lobulations are 2 to 3 cm. in height and in width.

Calices about 1 mm. in diameter, in one colony, are still smaller; moderately deep, angular and thin walled on the top of the corallum; rounded and thick walled at the basal part of the corallum. The wall at the top of the corallum reticular and porous, but it become thicker and the mural denticles become coarser and more prominent towards the basal part. The laterals of the ventral triplet remain free of each other, though often they come closer, without a true trident formation. Septa thin, side smooth in young calices, moderately granular in older ones. Septal denticle scarcely recognisable at the top of the corallum,

but are moderately developed in older calices. They are low, slender, smooth, and always stand below the level of the pali. Interseptal loculi wider than the septa.

Outer synapticular ring near the wall; inner below the palar crown. Pali 8, more prominent towards the lower part of the corallum, those of the lateral pairs of septa are larger with weak granulations.

Columella a deep seated, low, style joined to the septa by radii. In some cases the fossa gets filled with a tubercle in the middle.

Colour:

Living as well as washed and dried coralla exhibit a deep brown colour.

Localities:

Manauli Island, Pulli Island, Hare Island, Rameswaram (Bernard, 1905).

Distribution:

Indian Ocean - Gulf of Mannar around Mandapam.

Remarks:

The coral is of much interest because of its tendency, to get attached to the branches of Acropora. When the Porites attain a considerable size their substratum breaks leaving the colony free. In some cases, the basal part later get expanded so as to get themselves a better foothold on rocks. The present author had the opportunity to study several specimens belonging to this species, but none of the colonies was found really attached.

The species is fairly common in the Gulf of Mannar near Mandapam and it forms a good percentage of the total Porites brought ashore for economic purposes. Bernard's figure of the calices (Pl. 30, fig. 2) appears to be from the top of a corallum.

Porites lutea Milne Edwards and Haime, 1851.

(Pl. XV, fig. 6).

Porites lutea Vaughan, 1918, p. 198, pl. 88, figs. 1, 1a, 1b. (Synonymy).

Hoffmeister, 1925, p. 73, pl. 21, figs. 2a, 2b, 2c, 3.

Umbgrove, 1939, p. 58.

Crossland, 1941, p. 24, pl. 4. (lower two figures); pl. 5 (upper figure).

Wells, 1954, p. 452, pl. 165, figs. 1, 2; pl. 166, figs. 5, 6; pl. 167, figs. 1 to 7.

Nemenzo, 1955, p. 38.

Stephenson and Wells, 1956, p. 28.

Porites haddoni Vaughan, 1918, p. 197, pl. 87, figs. 1, 1a, 1b.

Porites stephensoni Crossland, 1952, p. 238, pl. 150, figs. 3, 4.

Description:

Corallum massive, expanded at the base, narrow at the top, surface undulate. Three specimens with basal diameters 22, 20 and 14 cm. respectively were collected.

Calices polygonal, shallow, 1 to 1.3 mm. in diameter. Corallite wall thin, zigzag at the top of the corallum, slightly thickened and straightened at the base of the colony. Mural denticles coarser at the basal part of the corallum than at the

top; roughly double the number of septa. The laterals of the ventral triplet fuse to form a trident. Septa thin, interseptal loculi wider, sides of septa granular. The degree of septal granulations vary in different colonies and in different part of the same corallum. A single septal denticle between the palus and the wall, which generally stands below the level of pali. Two rings of synapticula; the outer scarcely detached from the wall.

Pali 8, those of the lateral pairs of septa larger than others. Pali show marked variation in the degree of their development in different calices.

Columella a single style, compressed in the plane of the ventral directive, the latter extending to it as a keel. Columella stands always below the level of the pali of the lateral pairs of septa. It is joined to the septa by four or five radii.

Colour:

Corallum yellowish-brown.

Localities:

Mandapam (Palk Bay), Manauli Island.

Distribution:

Maldives (Wells and Davies, 1966);

Red Sea (Crossland, 1941); Tanganyika (Talbot, 1965); Gulf of Mannar and Palk Bay around Mandapam; Singapore (Purchon, 1956); Philippines; Banda Sea; Great Barrier Reef; Fiji; Marshall Islands; Samoa.

Porites somaliensis Gravier, 1910.

(Pl. XVI, figs. 1, 2).

Porites somaliensis Gravier, 1911, p. 80, pl. 11, figs. 46,47,48.

Vaughan, 1918, p. 198, pl. 87, figs. 2, 2a, 2b.

Eguchi, 1938, p. 386.

P. somaliensis has essentially a corallum similar to that of P. lutea. The calicular, septal and palar characters are almost similar in these two species. But, according to Vaughan (1918) their wall "appears to be persistantly different. That of P. lutea is zigzag, interrupted, ragged and in places near the lower edge it is obscure", but that of P. somaliensis is straight and better developed. However, these distinctions are no more tenable, since P. haddoni Vaughan (= P. lutea) is said to have nearly a straight corallite wall. The major differences between the two species by which the present author could separate them are the more conspicous and roughened mural denticles and better developed septal and palar granulations of P. somaliensis than that of P. lutea. Further, judging from the present specimens, the outer septal denticles of P. somaliensis are more prominent than in the other, and rise to the level of the pali of the lateral pairs of septa.

Colour:

Corallum dull-green.

Localities:

Mandapam (Palk Bay), Manauli Island, Hare Island, Tuticorin.

Distribution:

Somaliland; Madagascar (Pichon, 1964); Palk Bay and Gulf of Mannar around Mandapam; Cocos-Keeling Islands; Palau Islands.

Remarks:

The species is one of the commonest member of the genus around Mandapam.

Porites lichen Dana, 1846.

Porites lichen Dana, 1846, p. 567, pl. 56, fig. 3.
Vaughan, 1918, p. 203, pl. 90, fig. 3.
Wells, 1954, p. 463, pl. 165, fig. 3; pl. 168, figs. 1 to 6.

Description:

Corallum primarily encrusting with small protuberances at the top. Calices polygonal or circular, 0.8 to 1.2 mm. in diameter, shallow or as deep punctures. Intercorallite wall thin, 5 to 8 calices often running together to form short series with their walls little elevated. This is a marked feature of the species.

Septal number irregular, though both the cycles may be complete in some calices. In several calices the laterals of the ventral triplet - either one or both - are altogether dropped. Generally one septal denticle between the palus and the wall. Five prominent pali generally recognisable.

Columella when present a single style. In Majority of the calices it is absent leaving a central deep open fossa surrounded

by the inner synapticular ring.

Localities:

Mandapam (Palk Bay), Manauli Island, Hare Island. Seven specimens are collected. It is a fairly common species here.

Distribution: Maldives (Wells and Davies, 1966); Palk Bay and Gulf of Mannar around Mandapam; Cocos-Keeling Islands; Funafuti Atoll; Rotuma; Great Barrier Reef; Fiji; Marshall Islands.

Porites exserta new name.

(Pl. XVI, fig. 6).

Porites Ceylon (22) [13]
(P. ceylonica tertia decima). Bernard, 1905, p. 208, pl. 31, fig. 4; pl. 35, fig. 23.

Description:

Part of a corallum found attached to a semifossilised limestone brought to the shore, measures 8 x 8 cm. in greater spreads and 3 cm. thick at the broken edge. A few calcareous tubes of polychaetes are found on the top of the corallum which causes small protuberances, but for which the surface is level.

Calices shallow, rather illdefined, polygonal or rounded; 0.6 to 0.9 mm. in diameters. The nature of the intercorallite wall is unique in the present species. As stated by Bernard (loc. cit.) it "consists of a zigzag thread joining tall, erect and rather stout radial flakes with smooth edges and sides. These represent both wall trabeculae and exsert septa. Down the

sides these septa are less and less exsert till they do not rise above the level of the surface; the appearance of fresh synapticular junctions tends to make the wall reticular, and at the same time the smoothness of the elements is lost, and frosted swellings or granules appear".

The full number of septa can be recognised in some calices, whereas in others the septal number is rather irregular often the secondaries being incomplete. When the septal number is complete the laterals of the triplet remain free without a trident formation. A septal denticle is visible near the wall trabecula, but always stands below the level of the exsert septa. Inter-septal loculi wide, septal faces usually smooth but in some cases with granulations. Outer synapticular ring near the wall, often incomplete; inner below the pali surrounding a deep axial fossa.

Pali five, one each at the ends of the lateral pairs of septa and one on the ventral directive; subequal, well developed and secondarily frosted; standing below the level of the septal denticles.

Columella usually absent leaving a deep open fossa at the central part of the calyx. Section of the coral shows a loose, porous reticulum with vertical and horizontal bars.

Colour:

Corallum greenish-brown.

Locality:

Manauli Island.

Distribution:

Indian Ocean - Gulf of Mannar.

Remarks:

"The tall septal flakes rising like scales above the level of the surface" is a unique feature in this species. The specific name refers to the exsert nature of the septal ends. This species is however not a common one around Mandapam. Bernard's specimen come from Rameswaram.

Porites compressa Dana, 1846.

(Pl. XVI, figs. 4, 5).

Porites compressa Vaughan, 1907, p. 174, pl. 67; pl. 68, fig. 3.

Nemenzo, 1955, p. 31.

Description:

Corallum formed of vertical flabellate branches fused at their bases to form clumps of thick plates. The colony was lying free and it measured 40 cm. in greater diameter and 30 cm. in height including the base. Clumps upto 15 cm. broad and 10 to 12 cm. in height; basal parts dead, living zone extending 8 to 9 cm. from top to bottom. Tip of branches either divided into small flabellate secondary ones or, are entire with small lobulations.

Calices polygonal, excavated, 1 to 1.5 mm. in diameter, about 1 mm. deep with newly formed smaller ones in between them. Wall thin and wavy at the upper portions of the branches, moderately thickened below. Mural denticles compressed and frosted, roughly double the number of septa. Septa begin a little below

the summit of the wall. Members of the ventral triplet do not form a trident. Septa thin at the top of the branches with wide interseptal loculi, getting more thickened below; septal faces smooth to minutely granular. Single septal denticle between the palus and the wall.

Two rings of synapticula present, the outer seldom detached from the wall; the inner almost complete. Pali weakly developed, generally five, one each at the fused end of the four pairs of lateral septa, and one at the tip of the ventral directive.

Columella a thin lamella, compressed in the plane of the directive septa; joined to the septa by 4 to 5 radii.

Colour:

Corallum dull green in living condition.

Locality:

Krusadai Island. From lagoon, depth about 50 cm. during low tides. Bottom sandy.

Distribution:

Gulf of Mannar; Philippines; Palau Islands (Eguchi, 1938); Hawaii.

Remarks:

Vaughan (1907) has described and figured several formae and subformae of this species. It is not a common member of the genus at Mandapam.

Porites andrewsi Vaughan, 1918.

(Pl. XVI, fig. 3).

Porites andrewsi Vaughan, 1918, p. 203, pl. 91, figs. 1 to 2a.
Mayer, 1918, pl. 14, fig. 16.
Hoffmeister, 1925, p. 77, pl. 22, figs. 2a - 2c.
Thiel, 1932, p. 135, pl. 13, fig. 3.
Umbgrove, 1939, p. 58.
Crossland, 1952, p. 244.
Wells, 1954, p. 454, pl. 165, fig. 4; pl. 169, figs. 5, 6.
Stephenson and Wells, 1956, p. 28.

Description:

A clump measures 9 cm. in height. The main branch divides at its base into 5 irregular, crooked, anastomosing branches. The lower part is dead, the living zone is confined to the upper 4 to 5 cm.

Calices superficial, polygonal or rounded, about 1 mm. in diameter, with scarcely raised up walls. Mural denticles in the form of curly flakes, irregularly fused and highly frosted. The ventral triplet of the septa may fuse to form a trident. Septa not much thickened, the interseptal loculi almost equal in thickness to that of the septa. Septal sides granular. Two highly frosted septal denticles usually recognisable between the palms and the wall; the outer one near the wall, the inner always stands below the level of the outer. The outer synapticular ring is near the wall over which the outer ring of the septal denticle is situated. Pali 6, those of the lateral pairs of the septa much larger and highly frosted. The inner septal denticles of

the laterals of the ventral triplet stand, on either side of the pali of the ventral directive, stimulating two smaller pali. But according to Vaughan the morphological pali of the laterals of the ventral triplet is pressed to the columella and not easily visible.

Columella formed of a single style, compressed in the plane of the directive; joined to the septa by 4 to 5 radii.

Locality:

Minicoy.

Distribution:

Madagascar (Pichon, 1964); Minicoy; Banda Sea; Bay of Batavia; Murray Island; Great Barrier Reef; Low Isles; Marshall Islands; Solomon Island; Fiji.

Porites jonesi new species

(Pl. XVII, figs. 1, 2).

Description of the holotype:

Corallum unattached - free - ramose, with branches radiating from a central elongated body. Greater diameter of the colony about 7 cm. Branches 1.6 to 2.6 cm. long, upto 10 mm. thick at the base. Tip of branches expanded with small nodules.

Corallites polygonal, calices moderately deep and funnel-shaped, 1.25 to 1.5 mm. in diameter, shallower at the basal parts of the branches and on the central body where they are flush with the surface. Wall thin at the top of the branches, thicker below.

Septa thickened at the wall, wedge-shaped, the members of the ventral triplet generally fusing to form a trident. Septal faces highly granular with very narrow interseptal loculi. Edges of septa with 3 to 4 secondarily frosted serrations which make the interior of the calices appear highly spinose. Well defined septal denticles, other than these seerations, are absent. Outer synapticular ring fused to the wall; inner deep seated and hidden from view.

Pali not prominent, confusing with the septal serrations. The axial fossa very small, filled with solid coenenchyme, the centre of which is occupied by a flattened, highly frosted tubercle - the columella.

Colour:

Washed and dried corallum yellowish-brown.

Locality:

Minicoy. The author is informed that this species is fairly common at Minicoy where colonies often lie in sandy bottom in shallow waters.

Remarks:

P. jonesi new species appears to be quite different from any other species of ramose Porites hitherto described. The present specimen agrees in several respects to Bernard's (1905) Porites Amirantes (3)[3] (P. Amiranticum tertia) and Porites Providence (2)[1] (P. Prudentis prima), the last two probably one and the same. Even if, the present is proved to be identical with Bernard's above mentioned forms, the specific name may remain valid. The species is named after Dr. S. Jones, under whose guidance the present investigation is carried out.

Suborder FAVIINA Vaughan and Wells, 1943.

The suborder Faviina is divided into two superfamilies viz. Stylophyllicae and Faviicae; the former includes only Triassic and Cretaceous fossils, while the latter embraces both extinct and extact hermatypic and ahermatypic scleractinians.

Superfamily FAVIICAE Gregory, 1900.

Characters of the superfamily:

"Solitary and colonial, wall septo-thecal or parathecal. Septa laminar with very rare perforations, margins dentate" (Wells, 1956).

Under this superfamily, the familes, Faviidae, Rhizangiidae, Oculinidae, Merulinidae, Mussidae and Pectiniidae are only dealt with in this work.

Family FAVIIDAE Gregory, 1900.

Characters of the family:

Colonial, hermatypic, or rarely solitary, with laminar or rarely perforate, exsert septa with regularly dentate edges. Septa composed of one or two fan systems of simple or compound trabeculae. Asexual reproduction by extra or intratentacular budding. Paliform lobe usually present. Columella trabecular, rarely styliform or laminar.

Key to the subfamilies of Faviidae.

I. Colony formation mainly by various means intratentacular budding. -- Faviinae

II. Colony formation by extratentacular budding. -- Montastreinae

Subfamily FAVIINAE Gregory, 1900

The present collection includes six genera belonging to this subfamily. Besides, the genus Plesiastrea Milne Edwards and Haime is also known from this area (Gravely, 1927) by a single species - P. versipora (Lamarck).

Key to the genera of the subfamily considered herein.

I. Corallum ploceid massive or encrusting with rounded, oval or polygonal corallites united nearly to their top by costate coenosteum. -- Favia Oken

II. Corallum cerioid, calices polygonal, septa not of equal width at the wall. -- Favites Link.

III. Corallum cerioid or submeandroid; calices polygonal; septa generally of equal width at the thecal wall. -- Goniastrea Milne Edwards and Haime

IV. Corallum meandroid; columella perietal, continuous. -- Platygyra Ehrenberg.

V. Corallum meandroid, valleys narrower than in IV. Columella lamellar, continuous or interrupted. -- Leptoria Milne Edwards and Haime

VI. Corallum hydnophoroid, collines broken up into conical or elongated monticules -- Hydnophora Fischer de Waldheim.

Genus FAVIA Oken, 1815.

Favia Oken, Lehrb. Naturges. iii, p. 67 (cited after Matthai, 1914).
Vaughan, 1918, p. 100.

Genotype - Madrepora fragum Esper, 1795.

Generic characters:

Corallum plocoid, massive, foliaceous or encrusting. Corallites rounded, oval or polygonal; level or projecting, united by costate coenosteum nearly to their top. Septa exsert, with dentate edges. Columella parietal. Budding intratentacular the permanent condition being monostomodaeal.

Key to the species of Favia consid ered in this work.

Calices rounded or oval, level or projecting . . . . . A.
Calices polygonal . . . . . B.

A. I. Calices small, 2 to 3 mm. in diameter with three cycles of septa. -- F. stelligera (Dana).

II. Calices 12 to 23 mm. in diameter with 40 to 75 septa. -- F. favus (Forskal).

III. Calices slightly elongated, 9 to 16 mm. in diameter, not much projecting; 28 to 40 septa per calyx. Interior of the calyx highly blistery. -- F. speciosa (Dana).

IV. Calices 6 to 11 mm. in diameter, level to 6 mm. projecting, with 20 to 40 septa.-- F. pallida (Dana).

B. V. Calices polygonal usually hexagonal with or without a well defined intercorallite groove. -- F. valenciennesii* (Milne Edwards and Haime).

*Also spelt valenciennesi.

Favia stelligera (Dana), 1846.

(Pl. XVII, fig. 3).

Favia stelligera Vaughan, 1918, p. 101, pl. 34, figs. 2, 3; pl. 35, figs. 1 to 4. (Synonymy).
Hoffmeister, 1925, p. 23.
Crossland, 1931, p. 380, pls. 13, 14.
Umbgrove, 1939, p. 28.
Crossland, 1952, p. 128.
Wells, 1954, p. 475, pl. 73, figs. 5, 6.

Favia acropora Matthai, 1914, p. 102, pl. 25, figs. 1, 3; pl. 33, fig. 1; pl. 26, fig. 4.

Three colonies are placed under this species. Two of them are almost similar in their characters (Pl. XVII, fig. 3) and are described together; while the third shows slight variation in its calicular characters.

Description:

Two massive corallum found attached to a rock, measure. 11 and 7.5 cm. in greater diameters with 3 and 2 cm. respectively in thickness. Upper surface level. Coenosteum vesicular. Corallites circular or oval in out line, level or slightly projecting, 2 to 2.5 mm. in diameter, almost touching to a millimeter apart; about 1 mm. deep.

Septa 24, strickingly alternating in size; exsert, exsert ends arched and thickened at the wall; edges of septa serrated, sides granulose. Costae correspond to septa, the larger and smaller ones alternating in size. All the major septa extend to the columella, each with a prominent paliform lobe.

Columella moderately developed; filling half to two-third the bottom of the calyx.

A third specimen is a fragment 3.5 x 3.5 cm. at the top with a thickness of 4 cm. at the broken edge. It was found on a limestone brought ashore. Corallites 3 to 3.5 mm. in diameter not projecting, about 1 mm. apart. Septa 24 to 28 in different calices. Costae correspond to major septa; those of the subsidiary septa being not recognisable. In other characters the specimen agrees to the former ones.

Locality:

Manauli Island, Rameswaram (Sewell, 1935). Not a common species around Mandapam.

Distribution:

A widely distributed species in the Indo-Pacific; from Red Sea southward to Madagascar and then eastward upto Samoa.

Favia favus (Forskål), 1775.

(Pl. XVII, figs. 4, 5).

Madrepora favus (part) Forskal, 1775, p. 132.

Favia favus Matthai, 1914, p. 79, pl. 9, fig. 2; pl. 20, figs. 1 to 6; pl. 21, figs. 1 to 8; pl. 22, figs. 1 to 5; pl. 32, fig. 1; pl. 36, figs. 1, 2.

Matthai, 1924, p. 10.

Hoffmeister, 1925, p. 22.

Ma, 1937, pl. 28, fig. 6.

Crossland, 1941, p. 27.

Crossland, 1952, p. 125.

Wells, 1954, p. 458.

Favia magnistella Crossland, 1948, p. 185.

The collection includes specimens tallying with the following published figures of this species of other authors. Gardiner,(1904) Pl.LXIV, fig. 40; Matthai,(1914) pl. 20, fig. 5; Pl. 21, figs. 6, 7, 8; Pl. 22, fig. 1; Ma,(1937) pl. 28, fig. 6.

The present specimens broadly fall into two distant facies as follows:

(1) With level or slightly projecting calices and thick intercorallite region.

(2) Level calices with very thin, often interrupted intercorallite wall.

However, both these facies may be seen on the same corallum. A generalised description of the species from this region follows:

Corallum subhemispherical, generally 10 to 15 cm. in greater diameter. Intercorallite region vesicular, calices large, 12 to 22 mm. in diameter, oval, rounded or distorted; level or slightly projecting. Depth of calices vary from 5 to 10 mm. in different cases. Intercorallite region very thin or thickened upto 3.5 mm. Septa vary from 40 to 75, depending on the size of the calices. Septa exsert upto 1 mm., exsert ends either stopping at the middle of the intercorallite region wherever the latter is thickened, or continuous over it when it is thin. Upper two-thirds of the septa narrow, broader below, edges dentate, the lowest teeth being the largest; faces of septa

granular. Subsidiary septa sometimes fuse to the sides of the major ones. 15 to 20 septa reach the columella. A definite palar crown absent.

Columella trabecular, 3 to 6 mm. in diameter.

A small specimen (Pl. XVII, fig. 5) found attached to a calcareous alga is interesting. Calices of this specimen vary from 14 to 17 mm. in greater length; not projecting, and are 5 to 6 mm. deep. Intercorallite area is thickened upto 3 mm. Septa 40 to 46 out of which 17 reach the columella.

The most striking feature of the specimen is its peculiar septal dentition. On the exsert part of each major septa there are six teeth (number constant). The number of septal teeth get reduced to 4, 3, 2 in higher cycles. Tooth appear beaded to the naked eye but show a highly frosted nature when examined under the lens. Within the calyx 4 to 6 normal teeth are present. Colour of washed and dried corallum chocolate.

Locality:

Mandapam (Palk Bay) where it is fairly common.

Distribution:

Red Sea; Natal coast; Chagos; Maldives; Ceylon; Mandapam; Krusadai Island (Gravely, 1927); Philippines; Funafuti; Taiwan; Bay of Batavia; Great Barrier Reef; Bikini Atoll; Samoa.

Favia speciosa (Dana), 1846.

(Pl. XVII, fig. 6).

Astrea speciosa Dana, 1846, p. 220, pl. 11, figs. 1, 1a - 1d.

Favia speciosa Vaughan, 1918, p. 103, pl. 36, figs. 1, 2, 2a, 3, 4, 4a; pl. 37, figs. 1, 2, 3, 4, 4a.

Matthai, 1924, p. 12, pl. 1, figs. 3, 5, 8. (Since the figures are arranged upside down, they are figures 7, 5 and 2 respectively in Plate).

Hoffmeister, 1925, p. 23.

Yabe, Sugiyama and Eguchi, 1936, p. 28, pl. 20, fig. 7; pl. 23, fig. 1.

Umbgrove, 1939, p. 27.

Crossland, 1952, p. 127.

Wells, 1954, p. 457, pl. 174, figs. 2.

Stephenson and Wells, 1956, p. 30.

Description:

Corallum 13 x 10 cm. at the top and 5 cm. in thickness. An epitheca is visible at the growing edge. Surface highly vesicular.

Calices oval or slightly compressed, from side to side, level with the surface; elongated ones upto 14 mm. in length and 8 to 9 mm. in width; others 9 to 11 mm. in length. They are 3 to 4 mm. deep. Intercorallite region 2 to 4 mm. thick. Interior of the calices look highly blistery due to excessive deposition of endothecal vesicles.

Septa 28 to 38 in different calices out of which 12 to 16 reach the columella; 5 or 6 almost reach it but remain free. Septa exsert, exsert ends slightly arched. Septa thin at the wall, narrow at the top, broader below. Edges of septa with 4 to 6 teeth; septal sides granular. Costae prominent, continuous with the exsert

ends of septa; edges of costa dentate; costae of the adjacent corallites either stopping at the middle of the intercorallite region or united by means of a low transverse ridge.

Columella not very prominent, trabecular, with a few upwardly directed processes.

Locality:

The single specimen in the present collection was obtained from Manauli Island.

Distribution:

"Northern Red Sea through the Indian and Pacific Oceans as far as Fiji and Fanning Islands, but not found in Samoa or Tahaiti" (Crossland, 1952).

Remarks:

According to Matthai (1914) the species is characterised by a "light corallum, perithecal costae, open calices and thin septa". Gravely (1927) has recorded this as the commonest Krusadai species. However, the present author has not seen any specimen of this species at Krusadai Island, though carefully searched for.

Favia pallida (Dana), 1846.

(Pl. XVIII, fig. 1).

Astrea pallida Dana, 1846, p. 224, pl. 10, figs. 13, 13a - 13e.

Favia pallida Vaughan, 1918, p. 105, pl. 38, figs. 1, 3 to 7.

Hoffmeister, 1925, p. 23.

Yabe, Sugiyama and Eguchi, 1936, p. 29, pl. 19, figs. 1, 2.

Umbgrove, 1939, p. 27.

Wells, 1954, p. 457, pl. 173, figs. 1 to 4; pl. 174, fig. 1.

Stephenson and Wells, 1956, p. 29.

Favia doreyensis — Matthai, 1914, p. 84, pl. 9, figs. 1, 3; pl. 22, figs. 8, 9; pl. 33, figs. 2, 3, 4. (Synonymy).

Crossland, 1952, p. 127.

Favia hululensis — Gardiner, 1904, p. 769, pl. 61, figs. 19 to 21.

Matthai, 1914, p. 87, pl. 9, fig. 6; pl. 22, fig. 6; pl. 35, fig. 1.

Thiel, 1932, p. 52, pl. 6, fig. 2.

This is the commonest and most abundant member of the genus around Mandapam. The species exists here at least in two well defined formae. Each is described separately, the description being based on several specimens examined both in the field and in the laboratory.

Forma 1.

Corallum subhemispherical, larger colonies 15 to 20 cm. in greater diameter with vesicular coenosteum. Corallites circular or oval, 6 to 7 mm. in diameter, 4 to 5 mm. deep; level or projecting upto 1 mm. Thecal wall very thin; distance between adjacent corallites 1 to 3 mm.

Septa in larger calices 30 to 32; exsert, exsert ends arched, upper two-third narrow, broader below; edges of septa dentate, sides granular. 8 to 12 septa, usually 10, reach the columella. Costae prominent, those of the adjacent corallites either meeting midway or remaining free, thus alternating.

Columella poorly developed. The upper portion of the broader part of the septa stimulate a palus though a true palar crown is absent.

This forma agrees with Favia hululensis Gardiner, 1904.

Forma 2. (Pl. XVIII, fig. 1).

Corallum massive, subhemispherical, size varies from 5 to 20 cm. in diameter. Coenosteum vesicular. Corallites rounded or oval, 8 to 10 mm. in diameter, projecting to usually 3 to 4 mm., sometimes less; adjacent ones 2 to 4 mm. apart.

Septa 30 to 40 in different calices, exsert, exsert ends arched. Septa at first narrow and vertical, broader below; edges dentate, sides granular. 12 to 14 septa reach the columella, 4 to 6 almost reach it, but remain free. Costae prominent, with serrated edges, those of the adjacent corallites meeting at the middle of the intercorallite region over a transverse ridge. In some cases an alternating set of rudimentary costae without corresponding septa is present. Major septa with a weak paliform lobe.

Columella trabecular, 2 to 3 mm. in diameter. This facies corresponds to typical F. pallida.

Localities:

Mandapam (Palk Bay and Gulf of Mannar), Krusadai Island, Pulli Island, Manauli Island, Hare Island. A specimen from Chetlat Island and another from Andaman Islands are also referred to this species.

Distribution:

Madagascar (Pichon, 1964); Maldives; Chagos; Chetlat;

Palk Bay and Gulf of Mannar around Mandapam; Andaman Islands; Bay of Batavia; Philippines; Murray Island; Palau Islands; Caroline Island; Fiji and Samoa.

Favia valenciennesii (Milne Edwards and Haime), 1850.

(Pl. XVIII, figs. 2, 3, 4).

Favia bertholleti — Mathai, 1914, p. 94, pl. 7, fig. 2; pl. 22, fig. 7; pl. 23, figs. 4, 6; pl. 24, fig. 1. (Synonymy).

Favia valenciennesii — Matthai, 1924, p. 14, pl. 4, fig. 1; pl. 11, fig. 2.

Favia valenciennesi — Crossland, 1952, p. 126.
Wells, 1954, p. 458.
Stephenson and Wells, 1956, p. 31.

Favia (Phymastrea) valenciennesii — Umbgrove, 1939, p. 28, pl. 2, fig. 2.

Phymastrea valenciennesii — Yabe, Sugiyama and Eguchi, 1936, p. 31, pl. 22, figs. 3 to 5; pl. 24, fig. 5.

Description:

Five colonies were collected around Mandapam, a description of which follows.

Corallum encrusting or massive 10 to 18 cm. in greater diameter with a thin epitheca at the growing edge. In one specimen it was found that the epitheca extend into some of the peripheral intercorallite grooves thus surrounding the corallites as a thin gutter-shaped channel.

Calices polygonal, usually hexagonal, rarely pentagonal; 7 to 11 mm. in length, 6 to 9 mm. in width and 3 to 4 mm. in depth.

Wall fairly thickened with a narrow intercorallite groove. Septa 30 to 46 in different calices, excluding a set of rudimentary ones. Septa exsert, exsert ends arched, the outer edge stopping at the middle of the intercorallite groove. Septa narrow and vertical at first, broader below with dentate edges and spinulose sides. The last septal tooth stands almost vertically giving the impression of a palus. Some of the subsidiary septa turn towards and fuse with the sides of the major ones. 12 to 16 septa reach the columella. Columella 2 to 3 mm. in diameter, formed of closely twisted trabeculae.

A specimen obtained from Andaman Islands (Pl. XVIII, figs. 2, 3, 4) has got corallites 7 to 9 mm. in length with smaller ones intercalated. The corallites are not uniform in shape. Septa alternately thick and thin, exsert, exsert ends being little arched. Septal dentition weak. Columella trabecular. This specimen differs from the specimens collected around Mandapam in having much thinner wall, wider intercorallite grooves, less arched septa and poorly developed septal dentition.

Localities:

Mandapam (Palk Bay), Krusadai Island, Pulli Island and Andaman Islands.

Distribution:

Red Sea; Western Indian Ocean; Ceylon; Mandapam; Krusadai Island; Pulli Island; Andaman Islands; Mergui Archipelago; Banda Sea; Philippines; China Sea; Ryukyu Island; Queensland; Bikini Atoll.

Genus FAVITES Link, 1807.

Favites Link, 1807, Besch. Nat. Samml., Rostock, 3rd pt., p. 162. (cited after Vaughan, 1918).

Favia (part) Matthai, 1914, p. 77.

Genotype - Madrepora abdiata Ellis and Solander, 1786.

Generic characters:

Corallum cerioid, massive, foliaceous or encrusting. Calices polygonal, with fused intercorallite walls. Major septa not of equal width at the wall; with or without a set of rudimentary ones. Columella parietal. Asexual reproduction by mono to tristomodaeal intratentacular budding, the permanent condition being monostomodaeal.

Five species of this genus are described in this work out of which, F. virens and F. pentagona are recorded for the first time from the Indian region specifically. One of the earlier recorded species from Krusadai Island, viz. F. complanata (Ehrenberg) however, is not represented in the present collection.

Synopsis of the characters of the species of Favites described in this work.

I. Corallum encrusting, massive with hillocks or with flabellate small branches. Corallites 10 to 20 mm. in length, with one side elevated. Septa 40 to 75 per calyx.
-- F. abdiata (Ellis and Solander).

II. Corallum encrusting or massive, surface level; corallites 12 to 25 mm. in length; 5 to 7 mm. deep, with 40 to 45 major septa. -- F. virens (Dana).

III. Corallum encrusting with or without hillock; calices 10 to 12 mm. long and 3 to 6 mm. deep, with 25 to 40 septa; usually 30 to 32. The last septal teeth stand vertically up stimulating a palus. -- F. halicora (Ehrenberg).

IV. Corallum encrusting, corallites polygonal, calices rounded, 7 to 9 mm. in diameter, 2 to 3 mm. deep with 25 to 28 septa. Intercorallite wall 3 to 4 mm. thick, with a middle thin raised ridge. -- F. pentagona (Esper).

V. Corallum encrusting with hillocks; corallites and calices polygonal, 5 to 6 mm. in greater length, 2 to 4 mm. deep with 20 to 24 septa. -- F. melicerum (Ehrenberg).

Favites abdiata (Ellis and Solander), 1786.

Madrepora abdiata — Ellis and Solander, 1786, p. 162, pl. 50, fig. 2.

Favia abdiata — Matthai, 1914, p. 91, pl. 9, figs. 5; pl. 29, figs. 1 to 4; pl. 35, fig. 2.
Matthai, 1924, p. 13, pl. 9, fig. 9; (marked fig. 1 in Plate)pl. 4, fig. 2.
Matthai, 1926, pl. 25, figs. 2 to 4 and 7 to 9.

Favites abdiata — Vaughan, 1918, p. 109, pl. 40, figs. 1 to 5.
Hoffmeister, 1925, p. 24.
Yabe, Sugiyama and Eguchi, 1936, p. 31, pl. 22, figs. 3, 4.
Crossland, 1948, p. 189.
Crossland, 1952, p. 129.
Wells, 1954, p. 459.
Stephenson and Wells, 1956, p. 31.

The species is fairly abundant in various Islands in Gulf of Mannar near Mandapam. Large colonies may here attain 70 or 80 cm. in greater diameter, with characteristic hillocky mode of growth. In calicular and septal characters, majority of the specimens agree with Gardiner's (1904) description and figures of this species (described under the name Prionastraea fusco-viridis).

Three specimens - the largest 22 cm. in greater spread - collected from Palk Bay near Pamban, are of special interest. The upper surface of these colonies rises into clusters of flattened coalescent branches, 2 to 5 cm. in width and 2 to 4 cm. in height. This type of growth form in this species has already received attention from Matthai (1924).

Colour:

Living corallum yellowish-brown with deep green polyps. Polyps not found fully expanded during day.

Localities:

Mandapam (Palk Bay); Krusadai Island, Manauli Island, Hare Island and Minicoy.

Distribution:

A fairly common species throughout the Indo-Pacific from Red Sea eastward to Samoa.

Favites virens (Dana), 1846.

(Pl. XVIII, fig. 5).

Astraea virens Dana, 1846, p. 228, pl. 11, figs. 8, 8a to 8d.

Favia vasta — Matthai, 1914, p. 108, pl. 27, figs. 3, 5, 6. (Synonymy).

Matthai, 1924, p. 18, pl. 1, fig. 3; (labelled fig. 7 in Plate) pl. 9, fig. 1.

Favites virens — Vaughan, 1918, p. 111, pl. 41, figs. 4, 5.

Yabe, Sugiyama and Eguchi, 1936, p. 33, pl. 19, figs. 8, 9.

Umbgrove, 1939, p. 29.

Crossland, 1952, p. 130, pl. 6, figs. 1, 2.

Wells, 1954, p. 459.

Stephenson and Wells, 1956, p. 33.

The following description is based on several specimens examined.

Description:

Corallum primarily encrusting, tending to become massive, with convex upper surface. Larger colonies 15 to 20 cm. in greater diameter.

Calices polygonal, 12 to 17 mm. in length, 10 to 13 mm. in width and 4 to 7 mm. in depth. Intercorallite walls fused, without a groove; thin or thickened upto 2.5 mm. In an average sized calyx i.e. 14 or 15 mm. in length and 10 or 11 mm. in width, there are 40 to 46 septa, excluding 4 or 5 rudimentary ones. Septa thin within the calyx, sometimes slightly thickened at the wall. Septa exsert to about 1 mm., exsert ends continuous over the wall. Edges of septa with 6 to 10 teeth; septal sides granular. 3 to 4 subsidiary septa fuse with the sides of a major septa. 18 to 22 septa reach the columella. The lowest septal tooth is the largest and stimulate a palus.

Columella shows marked variation in the degree of its development in different calices. Generally it is 3 to 5 mm. in diameter, formed of closely twisted trabeculae; sometimes compact with "upright twisted lappets with spinulations".

Polyps partly expanded during day time.

Localities:

Mandapam (Palk Bay) where it is fairly common. The species is, however, not seen in the various Islands in the Gulf of Mannar near Mandapam.

Distribution:

Red Sea; Madagascar (Pichon, 1964); Chagos; Aldabra; Mandapam (Palk Bay); Philippines; Palau Islands; Ryu Kyu Island; Bay of Batavia; Murray Island; Queensland; Fiji; Bikini Island.

Favites halicora (Ehrenberg), 1834.

(Pl. XVIII, fig. 6).

Astraea halicora	Ehrenberg, 1834, p. 96.
Favia halicora	Matthai, 1914, p. 106, pl. 26, figs. 3, 5, 6, 7.
	Matthai, 1924, p. 17, pl. 1, figs. 4, 6.
Favites halicora	Vaughan, 1918, p. 110, pl. 4, figs. 1, 2, 3.
	Hoffmeister, 1925, p. 25.
	Crossland, 1948, p. 190
	Crossland, 1952, p. 128.
	Stephenson and Wells, 1956, p. 32.

The species is represented in the present collection by a corallum 17 x 10 cm. in greater diameters with a thickness of 5 cm. Upper surface level.

Corallites polygonal, calices rounded or polygonal. Intercorallite walls fused, 1.5 to 2.5 mm. thick at the top getting thicker below. An intercorallite groove absent. Greater diameter of calices 11 to 12 mm., lesser 8 to 10 mm.; depth 3 to 4 mm. but shallower towards the peripheral part of the corallum.

Septa 30 to 33 in larger calices excluding a set of rudimentary ones which are visible only at the thecal wall. Septa exsert, exsert ends continuous over the wall. Upper portions of the septa narrow, broader below. Edges of septa with 4 to 6 teeth, the last one being the largest and projecting up vertically. Subsidiary septa turn towards and fuse with the major ones. 18 to 20 septa reach the columella.

Columella oval, 3 to 4 mm. in diameter, formed of twisted trabeculae with upwardly directed, compressed twisted, frosted, thin plates.

Locality:

Mandapam (Palk Bay). The species is rare here; only a single specimen could be collected.

Distribution:

Red Sea; Natal Coast; Maldives; Chagos; Solomon; Aldabra; Ceylon; Mandapam; Andaman Islands; Singapore; Murray Island; Queensland; Fanning Island and Samoa.

Favites pentagona (Esper), 1794.

(Pl. XIX, fig. 1).

Favites pentagona Vaughan, 1918, p. 112, pl. 42, figs. 1, 2. (Synonymy).

Yabe, Sugiyama and Eguchi, 1936, p. 32, pl. 24, figs. 1, 2.

Umbgrove, 1939, p. 29, pl. 3, figs. 1, 2.

Description:

Corallum encrusting about 12 cm. in greater diameter, upto 8 mm. thick. Corallites polygonal - penta or hexagonal - larger ones 8 to 9 mm. in length when measured from centre to centre of the intercorallite walls. Intercorallite walls 3 to 4 mm. thick with a middle raised up thin ridge which marks the boundaries of the corallites. Calices rounded, 5 to 6 mm. in diameter, 2 to 3 mm. in deep with 25 to 28 septa. Septa very little exsert, exsert ends continuous over the wall. Septa of uniform width from top to bottom; edges with 8 to 12 teeth; septal sides spinulose. Subsidiary septa sometimes fuse to the sides of the major ones. 12 to 13 septa reach the columella. Larger septa with a palus like process.

Columella poorly developed formed of 3 or 4 trabeculae.

Colour:

Living corallum yellowish-brown. Polyps not found expanded during day time.

Locality:

The single specimen in the present collection was obtained from the eastern side of Manauli Island. The species is uncommon here.

Distribution:

Somaliland; Maldives; Minicoy; Manauli Island; Bay of Batavia and Sikoka.

Remarks:

The species has been excellently dealt with, both by Gardiner (1904) and Matthai (1914) under the name Aphrastraea deformis.

Favites melicerum (Ehrenberg), 1834.

(Pl. XIX, fig. 2).

Astraea melicerum	Ehrenberg, 1834, p. 96.
Favia pentagona	Matthai (non Esper), 1914, p. 95, pl. 10, fig. 5; pl. 24, figs. 2, 3, 4; pl. 36, fig. 4.
	Matthai, 1924, p. 14.
Favites melicerum	Vaughan, 1918, p. 112, pl. 4, figs. 6, 6a.
	? Crossland, 1948, p. 188, pl. 6 (lower figure).

Description:

Corallum encrusting with hillocks. A thin epitheca present at the growing edge. Greater diameter of the colony 21 cm.; maximum thickness at the level regions 2 cm. Height of hillocks upto 2 cm.

Calices polygonal - penta or rarely hexagonal - 5 to 6 mm. long, 4 to 5 mm. broad, and 2 to 3 mm. deep. Intercorallite walls fused, very thin at the top, thickened below to 1 mm.; solid in section with occasional small hollow cavities. Septa 20 to 24, alternating in size, very little exsert, exsert ends continuous over or stopping at the middle of the intercorallite wall. Upper part of septa narrow, edges with irregular dentition, septal sides granular. 8 to 12 septa reach the columella; each with a prominent paliform lobe.

Columella 1 to 2 mm. in diameter, trabecular.

Colour:

Corallum yellowish-brown in living condition. Polyps not expanded during day.

Locality:

From the protected side of the granite wall of the dock-yard at Mandapam. Gravely (1927) has recorded this species from Krusadai Island. Not a common species here.

Distribution:

Red Sea; ? Natal Coast; Maldives; Seychelles; Minicoy; Mandapam; Krusadai Island; Ceylon (Matthai, 1924); Mergui Archipelago; Cocos-Keeling Islands.

Remarks:

Vaughan (1918) has stated that the specific name pentagona is not available for the present species, as it was adopted by Matthai (1914) in his "revision of the recent colonial Astraeidae possessing distinct corallites"; since the specific name pentagona is to be applied to one of Esper's species, to which Aphrastrea deformis Lamarck is a synonym. "As the specific name pentagona is inapplicable melicerum Ehrenberg should be used as it seems to be the oldest of those proposed for this species". Vaughan's suggestion is followed in the present work.

Genus GONIASTREA Milne Edwards and Haime, 1848.

Goniastrea Milne Edwards and Haime, 1848, p. 495.

Matthai, 1914, p. 115.

Genotype - Astrea retiformis Lamarck, 1816.

Generic characters:

Corallum encrusting, massive, cerioid or submeandroid. Corallites polygonal with fused solid intercorallite walls. Septa generally of equal thickness at the wall. A feeble crown of paliform lobes present. Columella weak. Asexual reproduction by mono to tristomodaeal intratentacular budding.

The genus is represented in the collection by three species, out of which G. pectinata is recorded first time here from the Indian region specifically.

Synopsis of the characters of the species of Goniastrea considered herein;

I. Calices about 4 mm. long. Septa in 3 cycles, the third being incomplete. -- G. retiformis (Lamarck).

II. Calices 6 to 7 mm. long, upto 4 mm. deep without any meanders. A few of the fifth cycle of the septa also present. Septa much crowded at the top of the wall. -- G. incrustans Duncan.

III. Calices 5 to 11 mm. long, 4 to 7 mm. deep with occasional meanders. Septa in 4 cycles, rather wide apart at the top of the wall. -- G. pectinata (Ehrenberg).

Goniastrea retiformis (Lamarck), 1816.

Astraea retiformis Lamarck, 1816, p. 265.

Goniastrea retiformis Matthai, 1914, p. 118, pl. 31, figs. 1, 2, 3, 4, 5; pl. 33, fig. 3; pl. 38, figs. 2, 4.

Vaughan, 1918, p. 114.

Matthai, 1924, p. 20, pl. 4, fig. 3.

Hoffmeister, 1925, p. 26.

Yabe, Sugiyama and Eguchi, 1936, p. 34, pl. 18, figs. 5, 6.

Eguchi, 1938, p. 348.

Umbgrove, 1939, p. 32.

Crossland, 1952, p. 113.

Wells, 1954, p. 461.

Stephenson and Wells, 1956, p. 34.

Goniastrea solida Matthai, 1914, p. 117, pl. 10, fig. 1; pl. 28, figs. 3, 4; pl. 31, fig. 1; pl. 33, fig. 4; pl. 38, fig. 3. (Synonymy).

The species is fairly common in almost all localities around Mandapam. The largest colony measured was 60 cm. in greater diameter.

All the specimens examined possess, polygonal corallites about 4 mm. in greater diameter with thin (about 1 mm.) inter-corallite walls. Septa per calyx vary from 18 to 22 out of which 7 to 11 reach the columella. Major septa bear a well defined paliform lobe.

Columella spongy, poorly developed.

Polyps not found expanded during day time.

Localities:

Mandapam (Palk Bay and Gulf of Mannar), Krusadai Island, Pulli Island, Manauli Island, Hare Island.

Distribution:

From Northern Red Sea eastward to Samoa.

Remarks:

It is one of the easily recognisable members of the genus in the field by virtue of its small, uniform, polygonal calices and golden yellow colour of the corallum.

Goniastrea incrustans Duncan, 1889.

(Pl. XIX, fig. 3).

Goniastrea incrustans Duncan, 1889, p. 11, pl. 1, figs. 19, 20.

? Matthai, 1924, p. 21, pl. 2, fig. 4;

pl. 11, fig. 4.

Part of a specimen in the present collection is referred to this species.

Description:

Corallum encrusting with signs of small gibbosities. Greater diameter of the specimen 8.5 cm. with a maximum thickness of 12 mm. at the broken edge. Corallites polygonal - penta or hexagonal - 6 to 8 mm. long and 5 to 7 mm. broad; 3 to 4 mm. deep. Intercorallite walls fused, thin at the central part of the corallum but slightly thickened towards the periphery.

Septa vary greatly according to the size of the calices. For example a calyx 8 x 7 mm. has a total of 62 septa, whereas another 6 x 5 mm. possesses only 48 septa. Generally the first four cycles of septa are complete with a few of the fifth. Septa appear much crowded at the wall where they almost touch each other.

Larger and smaller septa alternating in size; very little exsert, exsert ends continuous over the wall. Edges of septa with 16 to 18 uniform sized secondarily frosted teeth. Septal sides spinulose. In larger calices 16 to 18 septa extend to the columella; 4 or 5 septa almost approach it. Subsidiaries fuse to the sides of the major ones. A low paliform lobe visible on the larger septa.

Columella deep seated, 1 to 1.5 mm. in diameter, formed of closely twisted trabeculae with 6 to 8 small papillose projections.

Locality:

Manauli Island, also Pamban (Sewell, 1935).

Distribution:

Indian Ocean - Palk Bay and Gulf of Mannar near Mandapam; Mergui Archipelago.

Remarks:

The species is very near to G. pectinata (Ehrenberg), but differs in having comparatively larger number of septa which are much crowded at the wall. Further meandering calices are totally absent in the present species. Thiel (1932) has doubtfully referred the specimen figured by Matthai (1924) under the present name to G. pectinata (Ehrenberg). The specimen described here is quite unlike any of the colonies of G. pectinata in the author's collection and he feels that there is sufficient ground for its separation.

Goniastrea pectinata (Ehrenberg), 1834.

(Pl. XIX, figs. 4, 5).

Astraea pectinata	Ehrenberg, 1834, p. 96.
Goniastrea pectinata	Matthai, 1914, p. 120, pl. 28, fig. 6; pl. 37, fig. 1.
	Vaughan, 1918, p. 114, pl. 42, figs. 3, 3a, 4, 4a; pl. 43, figs. 2, 3, 3a, 4, 5, 5a.
	Hoffmeister, 1925, p. 26.
	Thiel, 1932, p. 53, pl. 5, figs. 3, 4.
	Yabe, Sugiyama and Eguchi, 1936, p. 34, pl. 18, figs. 5, 6.
	Umbgrove, 1939, p. 32.
	Crossland, 1952, p. 135.
	Wells, 1954, p. 461.
	Stephenson and Wells, 1956, p. 34.
Goniastrea planulata	Matthai, 1914, p. 121, pl. 28, fig. 5; pl. 31, figs. 7, 8. (Synonymy).
	Vaughan, 1918, p. 116.
Goniastrea mantonae	Crossland, 1952, p. 136, pl. 7, figs. 1, 2.

The species is fairly common around Mandapam and a large number of specimens belonging to this species were examined during the course of the present investigation; a generalised description of which follows.

Description:

Corallum encrusting, explanate, later tending to become massive. Corallites polygonal with or without meanders. The corallites show bewildering variation in different coralla in

their size and septal numbers. In some cases they are only 5 to 7 mm. in length and 4 to 5 mm. in width but in others they may be upto 11 mm. long and 9 mm. broad. The depth vary from 4 to 7 mm. in different coralla. Septa vary from 30 to 40, generally between 30 and 36, often with a few rudimentary ones. Septa slightly exsert, exsert ends continuous over the intercorallite wall. Septa narrow at first, broader below with dentate edges and spinulose sides. Septa not touching each other at the thecal wall. Subsidiary septa turn towards and fuse to the sides of the major ones. 13 to 16 septa extend to the columella, each with a well defined paliform lobe.

Columella trabecular, poorly developed. In some cases they are denser and larger, about 2 mm. in diameter.

Polyps partly expanded during day.

Localities:

Mandapam (Palk Bay and Gulf of Mannar), Krusadai Island, Pulli Island, Manauli Island, Hare Island, Tuticorin, Andaman Islands.

Distribution:

Red Sea; southward to Madagascar (Pichon, 1964), eastward to Samoa. A widely distributed Indo-Pacific species.

Remarks:

Examination of a large suit of specimens has convinced the present author that G. mantonae Crossland is only a skeletal variation of the present species. Stephenson and Wells (1956) have already made a suggestion to this effect. It appears that

specimens growing on rocky bottom in deeper waters have comparitively larger and deeper calices than specimens growing in very shallow areas in sandy and muddy bottom. Three coralla obtained from the seaward side of the reef at Mandapam agree well with G. mantonae, one of which is figured in Pl. XIX, fig. 4 of this work. But intermediate forms do occur in the present collection which bridge the gap between the two forms.

Genus PLATYGYRA Ehrenberg, 1834.

Platygyra Ehrenberg, 1834, p. 323.
Brueggemann, 1879, p. 571.
Coeloria Matthai, 1928, p. 21. (Synonymy).

Genotype - Platygyra lamellina Ehrenberg, 1834.

Generic characters:

Massive, meandroid, valleys long and sinous, collines thin and perforated. Major septa with an internal paliform lobe. Septa very little exsert and continuous over the collines. Septal edges dentate. Columella trabecular, continuous. Asexual reproduction by intramural lenear polystomodaeal budding.

The genus is very common in all localities around Mandapam, though represented by only a single species, as identified below.

Platygyra lamellina (Ehrenberg), 1834.

Maendra (Platygyra) lamellina Ehrenberg, 1934, p. 323.
Platygyra lamellina Stephenson and Wells, 1956, p. 35. (literature and synonymy).

Description:

The present collection includes specimens matching with the following figures of Matthai (1928). Pl. 5, figs. 1, 3 and 6 (= Coeloria daedalea); Pl. 6, fig. 2; Pl. 8, fig. 5 (= C. lamellina).

Corallum massive, meandroid. Colonies generally between 20 to 30 cm. in greater diameter. The largest colony measured was 110 cm. in greater spread. Valleys range from single circumscribed corallites to lengthy sinuous ones upto 12 cm. in length. Width of valleys 5 to 7 mm. Collines thin at the top where they are perforated and sometimes interrupted, but swollen towards the base. Height of collines vary from 4 to 6 mm. Septa 12 to 17 per cm. length of colline, out of which 10 to 13 are larger and extend to the columella. Septa slightly exsert, exsert ends continuous over the collines. Septa narrow and vertical at first, broader below. Edges of septa with 4 to 7 small teeth the last one being the largest and almost standing vertically up. Septal sides granular.

Columella loose, trabecular, may or may not be broadened towards the end of valley; continuous or rarely interrupted. Polyps not found fully expanded during day time.

Localities:

Mandapam (Palk Bay and Gulf of Mannar), Krusadai Island, Manauli Island, Hare Island, Chetlat Island and Andaman Islands.

Distribution:

Red Sea; Persian Gulf; Madagascar (Pichon, 1964); Chagos;

Seychelles; Rodriguez; Christmas Island (Bernard, 1900); Maldives; Hululu; Minicoy; Chetlat Island; Palk Bay and Gulf of Mannar around Mandapam; Ceylon; Singapore; Andaman Islands; Mergui Archipelago; Philippines; China Sea; Amboina; Bay of Batavia; New Caledonia (Wells, 1961); Great Barrier Reef; Low Isles; Fiji; Marshall Islands; Fanning Island and Samoa.

Remarks:

This is one of the highly variable species. The major variations noted in the present specimens are in the length of valleys, and in the thickness and the degree of perforation of the collines. Stephenson and Wells (loc. cit.) has listed 41 references to this species between 1918 and 1955; while merging P. astreiformis (Milne Edwards and H aime), P. stricta (Milne Edwards and Haime), P. daedalea (Ellis and Solander), P. esperi (Milne Edwards and Haime) and P. rustica (Dana) into P. lamellina (Ehrenberg). Matthai (1928) has already merged P. simensis (Milne Edwards and Haime) with P. daedelea and was subsequently followed by Yabe, Sugiyama and Eguchi (1936) and Umbgrove (1939); though Wells (1954) regarded them separate. According to Stephenson and Wells (loc. cit.) "within the genus there seem no firm points for separating any of the species. P. astreiformis merges with P. stricta and thus to P. sinensis, P. rustica and P. lamellina". The species treatment adopted here, is that of Stephenson and Wells.

Genus LEPTORIA Milne Edwards and Haime, 1848.

Leptoria Milne Edwards and Haime, 1848, p. 493.

Platygyra Matthai (non Ehrenberg), 1928, p. 109.

Genotype - Madrepora phrygia Ellis and Solander, 1786.

Generic characters:

Corallum massive, meandroid, valleys long, straight or sinuous, narrow, about 4 mm. width, collines thin. Columella lamellar, thin continuous or interrupted. Asexual reproduction by intramural polystomodaeal budding.

Out of the two species, viz. L. phrygia and L. gracilis considered by Matthai (1928) under this genus, only the former is known among the Indian fauna.

Leptoria phrygia (Ellis and Solander), 1786.

(Pl. XIX, fig. 6).

Madrepora phrygia Ellis and Solander, 1786, p. 162, pl. 48, fig. 2.

Leptoria phrygia Vaughan, 1918, p. 117, pl. 45, figs. 4, 5; pl. 46, figs. 1, 2, 3.

Wells, 1950, p. 48.

Crossland, 1952, p. 150.

Stephenson and Wells, 1956, p. 37.

Platygyra phrygia Matthai, 1928, p. 112, pl. 1, fig. 3; pl. 10, figs. 5, 6, 7; pl. 11, figs. 5, 6; pl. 12, figs. 3, 6; pl. 49, figs. 1, 2; pl. 50, fig. 1; pl. 65, fig. 4. (Synonymy).

Yabe, Sugiyama and Eguchi, 1936, p. 38, pl. 57, fig. 7.

A part of a corallum found washed ashore at Krusadai Island represents this species in the present collection. Besides this, two fair sized coralla, preserved in the Museum of the Krusadai Biological Station were also examined.

Description:

Corallum massive, meandroid, valleys, 7 to 8 cm. long, straight or simuous, 2.5 to 3 mm. in width. Collines thin, 0.5 to 1 mm. thick at the top, about 2 mm. in height. Collines solid in section. Septa equal or sometimes alternating in size, 16 to 18 per cm. length of colline. Septa about 1 mm. exsert, exsert ends continuous over the collines. Septal edges with 2 to 5 teeth, sides of septa granular. Almost all septa extend to the columella but rarely a few stands half way to the latter.

Columella lamellar continuous rarely interrupted.

Locality:

Krusadai Island. The species is rare in this region. No living colony could be seen.

Distribution:

Red Sea; Mauritius; Madagascar (Pichon, 1965); Maldives; Minicoy; Ceylon; Krusadai; Cocos-Keeling Islands; Philippines; Palau Islands; Caroline Island; Australia; Fiji; Marshall Islands; Samoa; Tahiti.

Genus HYDNOPHORA Fisher de Waldheim, 1807.

Hydnophora Fisher de Waldheim. Matthai, 1928, p. 136.

Genotype - Madrepora exesa Pallas, 1766.

Generic characters:

Corallum explanate, massive with or without hillocks, sometimes ramose. Valleys continuous and sinuous. Collines broken up into several conical or elongated monticules. Septa narrow with dentate edges. Columella trabecular, or lamellar, discontinuous, sometimes poorly developed. Asexual reproduction by circummural polystomodaeal budding.

Key to the species of Hydnophora described in this work:

Columella well developed --- A.

Columella absent. --- B.

A. I. Corallum explanate or massive with hillocks. Montimules conical or slightly elongated, 7 to 10 mm. in width, about 4 mm. in height. -- H. exesa (Pallas)

II. Corallum massive, monticules small 1.5 to 3 mm. in thickness and height. -- H. microconos (Lamarck)

B. III. Corallum explanate, surface level; monticules swollen at the base, 6 to 7 mm. in length. -- H. grandis Gardiner

Hydnophora exesa (Pallas), 1766.

Madrepora exesa Pallas, 1766, p. 290.

Hydnophora exesa Matthai, 1928, p. 140, pl. 14, fig. 5; pl. 15, figs. 1, 2; pl. 16, figs. 1 to 4; pl. 17, fig. 3.
Yabe, Sugiyama and Eguchi, 1936, p. 39, pl. 25, fig. 7; pl. 29, fig. 2; pl. 30, fig. 2.
Umbgrove, 1939, p. 34.

Several specimens were examined, a generalised description

of which follows:

Description:

Corallum somewhat massive with the surface rising into hillocks 5 cm. or so in height. Valleys continuous and sinuous 4 to 6 mm. in width when measured from top to top of monticules. Monticules conical or elongated, elongated ones 7 to 8 mm. in length. Height of monticules about 5 mm. At the peripheral part of the corallum they are more swollen and running together for a considerable length. New formed smaller ones are found intercalated among the larger monticules.

There are 8 to 10 septa in a conical monticule, but their number may vary from 20 to 30 on elongated ones. Septa at first obliquely truncate, then vertically descending. Septa either of uniform size or sometimes larger and smaller ones alternating. Edges of septa dentate, their sides granulose. Larger septa reach the columella.

Columella well developed, continuous, surrounds the monticules.

Polyps found partly expanded during day time.

Locality:

Mandapam (Palk Bay); Krusadai (Gravely, 1927).

Distribution:

Red Sea; Maldives; Mauritius; Rodriguez; Aldabra; Ceylon; Mandapam; Krusadai Island; Tuticorin (Matthai, 1928); Singapore; Australia; China Sea; Arafura Sea; Torres Strait; Fiji; Philippines; Palau Islands; Caroline Island; Ryukyu.

Remarks:

Vaughan, (1918) was of opinion that H. contignatio(Forskål) and H. tenella (Quelch) are only stages of growthforms of H. exesa (Pallas). Gravely (1927) has also stated that H. contignatio is identical with H. exesa though he has apparently not referred to Vaughan (1918). But Matthai (1928) has attached little significance to Vaughan's statement, and considered all of them are separate. Crossland (1941) found it difficult to separate H. contignatio from H. exesa at Ghardaqa. The present author could study a fair suit of specimens in the field, all from the same locality, but they exhibit very little variation and are of little help in establishing the relationship of, either H. contignatio or H. tenella with H. exesa.

Hydnophora microconos (Lamarck), 1816.

(Pl. XX, fig. 1).

Monticularia microconos Lamarck, 1816, p. 251.

Hydnophora microconos Matthai, 1928, p. 144, pl. 2, figs. 8, 9; pl. 16, figs. 6, 9; pl. 17, figs. 1, 2, 4, 6; pl. 49, fig. 9.

Yabe, Sugiyama and Eguchi, 1936, p. 40, pl. 32, fig. 5.

Eguchi, 1938, p. 151.

Umbgrove, 1939, p. 34.

Crossland, 1952, p. 151.

Wells, 1954, p. 462.

Stephenson and Wells, 1956, p. 38.

The present collection includes three colonies of this species, the largest being 25 cm. in greater spread, with the surface rising in to hillocks as in the case of H. exesa. Valleys continuous, sinuous, about 3 mm. in width. Monticules 1 to 3 mm. thick at the base, 1 to 2 mm. in height, pointed at the top. Septa vary from 6 to 18 depending on the size of the monticules. They are subequal or sometimes alternating in size. They are at first narrow and slopping, below broadened to meet the columella. Edges of septa dentate, sides granulose.

Columella continuous, trabecular, surrounding the monticules.

Polyps partly expanded during day; and are notable for the excessive quantity of mucus that they extrude when taken out of water.

Localities:

Mandapam (Palk Bay), Shingle Island (Gravely, 1927), Manauli Island, Chetlat Island. The species is not so common as the previous one around Mandapam.

Distribution:

Red Sea; Madagascar; Maldives; Chagos; Chetlat Island; Mandapam; Shingle Island and Manauli Island; Mergui Archipelago; Philippines; Bay of Batavia; Funafuti; Great Barrier Reef; Palau Islands; Caroline Island; Fiji; Marshall Islands; Samoa.

Hydnophora grandis Gardiner, 1904.

(Pl. XX, fig. 2).

Hydnophora grandis Gardiner, 1904, p. 764, pl. LX, fig. 11.

Matthai, 1928, p. 150, pl. 2, figs. 10 to 13; pl. 47, fig. 3.

Yabe, Sugiyama and Eguchi, 1936, p. 40, pl. 30, figs. 3, 4.

Umbgrove, 1939, p. 34.

Description:

Corallum explanate, 30 cm. in greater spread, 3 cm. thick at the central part, edges thin with an epitheca; surface of corallum level.

Monticules conical, sharp or elongated. Elongated ones upto 8 mm. in length on the top of the corallum but may be upto 15 mm. at the growing edge of the corallum. Monticules swollen at the base to 5 to 7 mm. due to deposition of endothecal vesicles. They are 4 to 5 mm. tall, adjacent ones being 4 to 5 mm. apart at their top. Septa 8 to 10 on a conical monticule but may be upto 20 on elongated ones. Septa subequal or with occasional smaller ones. Upper part of septa narrow and vertical, broader below. Septal edges dentate, sides rough. Columella generally absent, rarely marked by centres that are never continuous. The lower end of the major septa get apposed at the middle of valleys.

Polyps partly expanded during day.

Locality:

The single specimen in the collection was obtained from Mandapam (Palk Bay).

Distribution:

Maldives; Mandapam; Bay of Batavia; Honsyu.

Remarks:

The species differs from H. exesa in the absence of hillocks

on the surface of the corallum, presence of excessive deposition of endothecal vesicles at the sides of the monticules and in the absence of a well defined columella.

Subfamily MONTASTREINAE Vaughan and Wells, 1943.

Four genera of this subfamily are considered in this work. A fifth genus viz. Diploastrea is also known among the Indian fauna, by a single species D. heliopora (Lamarck), from Minicoy.

Key to the genera of the subfamily considered herein.

Coenosteum costate --- A.

Coenosteum spiny --- B.

A. I. Corallites polygonal, level or slightly projecting with imperforate intercorallite walls usually with a middle groove. -- Leptastrea Milne Edwards and Haime.

II. Corallum plocoid, wall thin and porous. Septa sometimes confluent between calices. Coral black.

-- Oulastrea Milne Edwards and Haime

B. III. Corallite small level or projecting, 1.5 to 3 mm. in diameter; rounded; wall imperforate. Spines small and scattered. -- Cyphastrea Milne Edwards and Haime.

IV. Corallites rounded, larger than in III; spines large, their bases fusing to form low ridges.

-- Echinopora Lamarck.

Genus LEPTASTREA Milne Edwards and Haime, 1848.

Leptastrea Milne Edwards and Haime, 1848, p. 494.

Barysastrea Milne Edwards and Haime, 1848, p. 495.

Genotype - Leptastrea roissyana Milne Edwards and Haime, 1850.

Generic characters:

Corallum encrusting or massive. Corallites polygonal or rounded, level or slightly projecting. Intercorallite walls fused with a middle groove. Coenosteum dense; costate. Septa slightly exsert with dentate edges. Columella small, generally papillose.

Three species of this genus are known from the Indian region viz. L. purpurea (Dana), L. transversa (Klunzinger) and L. bottae (Milne Edwards and Haime). The first two are represented in the present collection, while L. bottae is recorded only from Minicoy among the Indian fauna.

Leptastrea purpurea (Dana), 1846.

(Pl. XX, figs. 3, 4).

Astraea purpurea Dana, 1846, p. 239, pl. 12, figs. 10a - 10c.

Leptastrea purpurea Vaughan, 1918, p. 91, pl. 30, figs. 1, 1a, 2, 3, 3a.

Hoffmeister, 1925, p. 20.

Yabe, Sugiyama and Eguchi, 1936, p. 26, pl. 48, figs. 4 to 7.

Umbgrove, 1939, p. 26.

Crossland, 1948, p. 184.

Wells, 1950, p. 48.

Crossland, 1952, p. 115, pl. 1, fig. 5; pl. 3, fig. 3.
Wells, 1954, p. 463.
Stephenson and Wells, 1956, p. 38.

Leptastrea ehrenbergana Matthai, 1914, p. 68, pl. 17, figs. 1 to 5; pl. 18, figs. 2, 7; pl. 19, figs. 3, 4; pl. 34, fig. 8. (Synonymy).

Seven colonies are referred to this species. They fall into two distinct facies; i.e. (1) those agreeing with typical L. purpurea (Dan) as described and figured by Vaughan (1918), and (2) those agreeing with L. ehrenbergana Milne Edwards and Haime as described by Matthai (1914). Each is described separately below.

Typical L. purpurea facies (Pl. XX, fig. 3).

Four colonies are referred to this facies.

Corallum encrusting with polygonal corallites. Corallites level, not projecting, 5 to 8 mm. long and 3 to 6 mm. broad; 2 to 3 mm. deep. Intercorallite walls slightly thickened with a middle groove. Number of septa vary according to the size of the calices. For example, a calyx 5 x 3 mm. has 38 septa; a second 6 x 6 mm. has 51 septa, whereas a third, 8 x 4 mm. has 58 septa. Septa slightly exsert, exsert ends stop at the intercorallite groove. Upper portions of septa narrow, broader below; edges with 3 to 5 teeth, sides coarsely granular. Septa alternating in size, smaller ones either remain free, or fusing to the sides of the major ones. 14 to 20 septa reach the columella.

Columella narrow or elongated, trabecular with upright papiliform projections.

L. ehrenbergana facies (Pl. XX, fig. 4).

Three colonies are placed under this facies. This is a thicker and rougher facies than the previous. Corallites polygonal with slightly projecting wall. Intercorallite walls thickened with a well marked middle groove. Calices oval or rounded, 5 to 6 mm. in diameter. The first two cycles of septa are broader than others. Other characters as in the previous facies.

Localities:

Mandapam (Palk Bay), Krusadai Island, Manauli Island.

Distribution:

Red Sea; Natal coast; Maldives; Minicoy; Chagos; Solomon; Palk Bay and Gulf of Mannar around Mandapam; Cocos-Keeling Islands; Philippines; Rotuma; Funafuti; Queensland; Fanning Island; Marshall Islands; Hawaii; Samoa.

Leptastrea transversa Klunzinger, 1879.

(Pl. XX, figs. 5, 6).

Leptastrea transversa Klunzinger, 1879,(part 3), p. 46, pl. 6, fig. 2.

Vaughan, 1918, p. 94, pl. 31, figs. 1, 1a.

Crossland, 1952, p. 115, pl. 54, figs. 1 to 3.

Stephenson and Wells, 1956, p. 39.

Leptastrea roissyana Matthai, 1914, p. 67, pl. 8, figs. 1 to 3; pl. 17, fig. 4; pl. 18, fig. 1; pl. 19, figs. 1, 2; pl. 37, fig. 4.

Matthai, 1924, p. 9.

Description:

Corallum encrusting, rarely massive. Average sized colonies 10 to 15 cm. in greater diameter. Corallites polygonal with fused, thin intercorallite walls about 1 mm. thick. Intercorallite groove shallow. Calices 3 to 4 mm. long, 2 to 3 mm. broad, 2 to 3 mm. deep. Total number of septa vary from 28 to 38, usually about 30. Septa slightly exsert and swollen at the wall, thin within the calyx. Septal edges dentate, sides smooth or rarely granular. 12 to 16 septa reach the columella, the directives of the primary cycle of septa being the broadest and almost meeting each other over the columella.

Columella trabecular, small.

Localities:

Mandapam (both Palk Bay and Gulf of Mannar); Krusadai Island, Pulli Island, Manauli Island and Hare Island. This is a fairly common species in all these localities and occur in fair numbers.

Distribution:

Red Sea; Minicoy; Maldives; Solomon Island; Ceylon; Gulf of Mannar and Palk Bay around Mandapam; Mergui Archipelago; Great Barrier Reef; Fanning Island; Tahiti (Crossland, 1931).

Remarks:

An interesting case of excessive extratentacular budding was noted in one of the specimens (Pl. XX, fig. 5). The buds are much crowded, almost touching each other covering the entire intercorallite walls throughout the colony.

Genus OULASTREA Milne Edwards and Haime, 1848.

Oulastrea Milne Edwards and Haime, 1848, p. 495.

Genotype - Astrea crispata Lamarck, 1816.

Generic characters:

Corallum plocoid, corallites polygonal, projecting to 1 mm.; walls somewhat porous. Septa sometimes confluent between calices. Septa edges dentate. Columella papillose. The papilla merging with the paliform lobes. Corallum black in colour.

Vaughan and Wells (1943) placed this genus under the family Agariciidae. But Wells (1956) transferred it to the present family with a remark "it may be an Agariciid". Wells is followed here.

The present record of this genus is new to Indian region.

Oulastrea crispata (Lamarck), 1816.

(Pl. XXI, fig. 1).

Astrea crispata Lamarck, 1816, p. 265.

Oulastrea crispata Yabe, Sugiyama and Eguchi, 1936, p. 54, pl. 9, figs. 4a, 4b; ? Pl. 42, figs. 1 to 4.

Umbgrove, 1939, p. 42.

Kawaguti and Sakumoto, 1954, p. 265, figs. 1a, 1b, 2a, 2b.

Nemenzo, 1955, p. 9, pl. 1, fig. 3.

Description:

A fragment measures 3 x 3 cm. at the top with a thickness of 1 cm. at the broken edge.

Corallites projecting to 1 mm.; walls distinct but thin, separated by narrow intercorallite regions. Corallites oval or distorted, 3.5 to 5 mm. in diameters, mode 4 mm.; about 2 mm. deep. They are funnel-shaped when viewed from above. In an average sized calyx there are 24 to 28 septa, but a calyx 5 mm. in diameter has 40 septa. Septa exsert, exsert ends arched and stopping at the middle of intercorallite region or sometimes confluent between calices. The latter condition is more common at the peripheral part of the corallum than at the centre. Septa project about a mm. into the calyx at the top. Septal edges serrated, the serration becoming larger below where they merge with the paliform lobes. Sides of septa grnular. 12 to 15 septa reach the columella, others fuse to the sides of the major ones.

Columella poorly developed with a crowded cluster of papilliform processes.

Colour:

Washed and dried corallum exhibit a black colour except at the exsert portions of the septa, where they are white.

Locality:

Andaman Islands.

Distribution:

Andaman Islands; Singapore (Purchon, 1956); Bay of Batavia; Amboina; Philippines; Sikoku; Honsyu; Taiwan.

Remarks:

Nemenzo (1955) has described a new species of Oulastrea from Philippines under the specific name alta. He has suggested

that the specimen figured by Yabe, Sugiyama and Eguchi (1936) in their plate 42, figs. 1 to 4, may possibly belong to his O. alta.

Genus CYPHASTREA Milne Edwards and Haime, 1848.

Cyphastrea Milne Edwards and Haime, 1848, p. 494.
Matthai, 1914, p. 38. (Synonymy).

Genotype - Astrea microphthalma Lamarck, 1816.

Generic characters:

Corallum encrusting or massive with or without gibbosities. Corallites rounded, level or slightly projecting; 1.5 to 3 mm. in diameter. Septa in three cycles. Coenosteum spiny, spines low and scattered. Columella small, trabecular.

Key to the species of Cyphastrea described in this work.

Three cycles of septa complete, out of which 12 reach the columella. Coenosteum vesicular. --- A.

Third cycle of septa incomplete. Coenosteum dense. --- B.

A. I. First cycle of septa and costae thicker than the second cycle. -- C. serailia (Forskål).

II. First two cycles of septa and costae subequal. -- C. chalcidicum (Forskål).

B. III. Total number of septa 20 out of which 10 reach the columella. -- C. microphthalma (Lamarck).

Cyphastrea serailia (Forskål), 1775.

(Pl. XXI, fig. 2).

Madrepora serailia (part) Forskal, 1775, p. 135.

Cyphastrea serailia Matthai, 1914, p. 39, pl. 7, fig. 4; pl. 11, figs. 1 to 9; pl. 13, fig. 8; pl. 33, figs. 1, 5.

Vaughan, 1918, p. 88, pl. 29, figs. 2, 2a, 2b.

Matthai, 1924, p. 7.

Yabe, Sugiyama and Eguchi, 1936, p. 24, pl. 18, fig. 2.

Eguchi, 1938, p. 342.

Umbgrove, 1939, p. 26.

Crossland, 1941, p. 46.

Crossland, 1952, p. 118.

Wells, 1954, p. 463.

Description:

Corallum explanate, the largest specimen in the collection 30 cm. in greater spread. Coenosteum vesicular, spiny. Corallites rounded or oval, 2 to 2.5 mm. in diameter; level or projecting upto 2 mm.; touching each other or upto 2 mm. apart. Wall a bit thickened, vertical or oblique. Septa 24, primaries always thicker than the secondaries. Septa exsert, exsert ends arched, edges dentate, sides spinulose. 12 septa reach the columella. Columella trabecular with upright thin rods.

Costae correspond to septa, those of the primaries being the largest.

Polyps not found expanded during day time.

Localities:

Mandapam (Palk Bay), Manauli Island, Krusadai Island (also Gravely, 1927).

Distribution:

Red Sea; Somaliland; Maldives; Ceylon; Palk Bay and Gulf of Mannar around Mandapam; Philippines; Bay of Batavia; Palau Islands; Ryukyu Island; Murray Island; Great Barrier Reef; Marshall Islands.

Cyphastrea chalcidicum (Forskål), 1775.

(Pl. XXI, fig. 2).

Madrepora chalcidicum Forskal, 1775, p. 136.

Cyphastrea chalcidicum Matthai, 1914, p. 41, pl. 7, figs. 1, 5; pl. 12, figs. 1, 2, 3; pl. 14, fig. 1.
Matthai, 1924, p. 7.
Yabe, Sugiyama and Eguchi, 1936, p. 24, pl. 18, fig. 1; pl. 49, fig. 5.
Crossland, 1941, p. 46.
Wells, 1950, p. 49.
Crossland, 1952, p. 117.
Wells, 1954, p. 464.
Stephenson and Wells, 1956, p. 39.
Squires, 1962, p. 138, pl. 4, figs. 1, 2.

Description:

Corallum somewhat massive; coenosteum vesicular with scattered low spines. Corallites rounded or oval, projecting vertically to about 1.5 mm. Diameter of the calices about 2 mm.

close together or upto 2 mm. apart. Thecal wall less thickened than in C. serailia. Septa in 3 complete cycles. Primaries and secondaries subequal, extending to the columella. Septa exsert, exsert ends arched; edges dentate, sides rough. Costae of the first two cycles of septa subequal; those of the tertiaries rudimentary.

Columella trabecular, deep seated.

Polyps not found expanded during day time.

Locality:

Mandapam (Palk Bay). The species is not common here. Only two specimens could be seen.

Distribution:

Red Sea; Maldives; Ceylon; Krusadai Island (Gravely, 1927); Mandapam (Palk Bay); Singapore; Cocos-Keeling Islands; Philippines; Palau Islands; Great Barrier Reef; Marshall Islands; Laysan; Hawaii.

Remarks:

One of the specimens in the collection is an oval mass found lying free. This colony appears to have originally started its growth on a branch of Acropora sp. which later broke of leaving the colony free.

Cyphastrea microphthalma (Lamarck), 1816.

Astrea microphthalma Lamarck, 1816, p. 261, 2nd ed. p. 408.

Cyphastrea microphthalma Matthai, 1914, p. 43, pl. 7, fig. 6; pl. 12, figs. 4 to 9; pl. 13, figs. 1, 2, 7; pl. 34, fig. 4.

Vaughan, 1918, p. 88, pl. 29, figs. 1, 1a.

Hoffmeister, 1925, p. 19.

Yabe, Sugiyama and Eguchi, 1936, p. 23, pl. 17, figs. 7, 8.

Eguchi, 1938, p. 342.

Crossland, 1941, p. 46.

Crossland, 1952, p. 118.

Stephenson and Wells, 1956, p. 40.

Description:

Corallum as thick crust 15 to 20 cm. in greater spread. Upper surface usually rises into hillocks or into irregular digitiform branches often with a central worm-tube. One of the specimens in the collection exactly resembles in its growthform to the one which Matthai (1914) has figured in his Pl. 13, fig. 7.

Coenosteum dense, with closely set pointed small spines. Corallites rounded 1 to 1.5 mm. in diameter; level or slightly projecting, adjacent ones touching each other or upto 2 mm. apart. Septa 20 out of which 10 extend to the columella. The occurrence of giant calices with double the number of usual septa is a frequent feature in this species. Septa thickened at the wall, exsert, exsert ends arched with dentate edges and granulose sides. Costae sunk, but their course is marked by a line of spines continuous with the outer edges of the septa.

Columella trabecular.

Colour:

Living corallum yellow or brown.

Locality:

Mandapam (Palk Bay), where it is fairly common. Not found in the Gulf of Mannar side.

Distribution:

Red Sea; Maldives; Mandapam; Philippines; Cocos-Keeling Islands; Caroline Island; Palau Islands; Ogasawara Island; Ryukyu Island; Sikoku; Great Barrier Reef; Marshall Islands; Samoa and Tahiti.

Remarks:

This species differs from other members of the genus, in having only 20 septa per calyx, out of which 10 reaching the columella. It is also notable for the excessive quantity of mucus that it extrudes when taken out of water.

Genus ECHINOPORA Lamarck, 1816.

Echinopora Lamarck, 1816, p. 252.

Matthai, 1914, p. 48. (Synonymy).

Genotype - Madrepora lamellosa Esper, 1797.

Generic characters:

Corallum massive, ramose or foliaceous. Coenosteum dense or vesicular with prominent spines. Base of spines fuse to form small ridges. Thecal wall perforate. Calices oval or rounded, level or projecting. Septa in 3 to 5 cycles; exsert with dentate edges. Columella spongy or trabecular.

The present collection includes two species of this genus viz. E. lamellosa and E. gemmacea. The former is already known to this region (Gravely, 1927), while the latter is a new record to India.

Echinopora lamellosa (Esper), 1797.

(Pl. XXI, fig. 4).

Madrepora lamellosa Esper, 1797, p. 65, pl. 58, figs. 1, 2.

Echinopora lamellosa Matthai, 1914, p. 50, pl. 14, figs. 2 to 6; pl. 15, fig. 1; pl. 16, fig. 6.

Vaughan, 1918, p. 97, pl. 32, figs. 1, 1a, 2, 2a, 3.

Matthai, 1924, p. 8.

Thiel, 1932, p. 40, pl. 3, fig. 1.

Yabe, Sugiyama and Eguchi, 1936, p. 48, pl. 58, fig. 1.

Umbgrove, 1939, p. 38.

Crossland, 1952, p. 119.

Wells, 1954, p. 464.

Stephenson and Wells, 1956, p.40.

This foliaceous species is very abundant both at Manauli and Krusadai Island forming platforms 1 to 2 metres in greater diameter, growing mixed with similar platforms of Montipora foliosa (Pallas). Dead parts of these platforms often afford substratum for other species of corals.

Description:

Matthai's (1914) description of the species is as follows. "Corallum very thin, margins irregularly folded up, attached below in the centre. Peritheca dense, with slender spinulate echinulations, their bases usually fused to form low thin perithecal costae, towards edges of corallum spines disappearing but ridges remaining. Corallites almost circular, projecting up to 2 mm. (usually 1.25 mm.), up to 6 mm. apart (average 3 mm.). Calices

with diameter 3.5 mm., depth 1.5 mm.; quite shallow towards edges of corallum.

Septa in three orders, tertiaries very thin, up to 4 quaternaries sometimes present, sides rough, perforated, edges denticulate. Primaries sometimes thicker than secondaries, these and up to 6 tertiaries meeting columella; septa of even thickness along their breadth or somewhat thickened in thecae, margins vertical, exsert to 1 mm. The exsert ends of primaries and secondaries divided by two notches - not extending below calicular margins - into an inner arched lobe and two outer bluntly-pointed teeth, the last appearing as the first costal tooth. Costae comparatively thin, with one or two spinulate echinulations. Columella of close trabeculae, up to two-thirds width of calyx".

The present specimens agree in their growthform and calicular characters, with the above description quoted and need no further remarks.

Localities:

Krusadai Island, Manauli Island, Hare Island. The species seems to be absent on the reefs of Mandapam (Palk Bay). A small piece from Chetlat Island is also referred here.

Distribution:

Tanganyika (Talbot, 1965); Madagascar (Pichon,1964); Maldives; Laccadives; Krusadai Island; Manauli Island; Hare Island; Ceylon; Andaman Islands (Matthai, 1924); Cocos-Keeling Islands; Philippines; Bay of Batavia; Banda Sea; Fiji; Palau Islands; Ogasawara Island; Great Barrier Reef; Marshall Islands.

Remarks:

Boschma (1925) has described in detail "an unusual type of budding" in this species which he observed at Sunda strait. Boschma and Verwey (1930) in a later paper have adduced more details of this phenomenon. Examination of several colonies around Mandapam in the Gulf of Mannar side during the present work, has revealed that this "unusual type of budding" which Boschma observed, is quiet a usual phenomenon in this species around Mandapam. These buds may assume a height of 1 cm. or more and may bear secondary calices thus appearing as meniature colonies. One such is figured in Pl. XXI, fig. 4 of this work.

Echinopora gemmacea (Lamarck), 1816.

(Pl. XXI, figs. 5, 6).

Explanaria gemmacea Lamarck, 1816, p. 256, 2nd edt. p. 399.

Echinopora gemmacea Matthai, 1914, p. 54, pl. 14, fig. 9; pl. 15, figs. 5, 6; pl. 16, figs. 5, 7, 8; pl. 17, figs. 2, 3; pl. 37, fig. 5.

? Thiel, 1932, p. 42, pl. 4, figs. 3, 4.

Crossland, 1935, p. 503, pl. 3, figs. 1 to 4.

Umbgrove, 1939, p. 38.

Description:

Two specimens are referred to this species. Corallum foliaceous, funnel-shaped 19 and 13 cm. respectively in greater diameters at the top. Coenosteum dense, with spines forming small ridges continuous with the costae. Spines highly frosted at their top.

Corallites circular or oval, larger ones 4 mm. in diameter at the top 4 to 6 mm. at the base, projecting up to 2.5 mm.; adjacent ones touching to 5 mm. apart. Calices 1 to 1.5 mm. deep with oblique opening.

Septa in 4 cycles, the fourth usually incomplete with a total of 36 to 38 septa. Septa exsert, exsert ends arched and continuous with the costae. Septal edges with 3 to 4 well developed teeth those at the exsert portions of the septa being vertical and secondarily frosted. Sides of septa with prominent spinulations. 14 to 18 septa reach the columella, others generally fuse to the sides of the major ones.

Columella trabecular, with a few papillose projections.

Locality:

Krusadai Island. Collected from the top of a dead platform of M. foliosa. The species is very rare here.

Distribution:

Red Sea; Somaliland (Gravier, 1911); Mauritius; Madagascar (Pichon, 1964); Seychelles; Krusadai Island; ? Banda Sea; Bay of Batavia.

Remarks:

The present specimens differ from specimens of E. lamellosa in the collection, in having larger and more projecting corallites, greater number of septa, better developed spines and highly frosted septal dentition, altogether giving a coarser and uglier appearance to the corallum.

Family RHIZANGIIDAE d' Orbigny, 1851.

Characters of the family:

Mainly ahermatypic; reptoid colonies with extratentacular budding from a stolen or edge zone. Corallites either remain attached to the stolen or their connection may be secondarily severed. Corallites small, septa irregularly dentate. Columella trabecular, rarely solid or even wanting.

Only the genus Culicia of this family is considered in this work.

Genus CULICIA Dana, 1846.

Culicia Dana, 1846, p. 376.

Cylicia Duncan, 1885, p. 64. (Synonymy).

Genotype - Culicia stellata Dana, 1846.

Generic characters:

Corallum reptoid or tympanoid; corallites 1.5 to 6 mm. in diameter, low, either remain attached to a stolen or secondarily free. Outer side of the corallites strongly epithecate. Primary or sometimes secondary cycles of septa lobate, with irregularly dentate edges. Columella feeble, papillary.

The collection includes a single species of this genus viz. C. rubeola. Besides this, Matthai (1924a) has provisionally assigned a few specimens from Chilka Lake to C. smithi (Milne Edwards and Haime); among the Indian fauna.

Culicea rubeola (Quoy and Gaimard), 1833.

(Pl. XXII, fig. 1).

Culicea rubeola Wells, 1954, p. 464, pl. 135, figs. 3 to 6.

(Synonymy).

Ralph and Squires, 1962, p. 4, pl. 1, figs.1 to 5.

Matthai (1924a) summarises the characters of this species as follows: "Diameter of the calyx 4 mm. Height of corallite 5 mm. Depth of calyx 4 mm. Number of cycles of septa 3, 3rd incomplete. Columella well developed".

Description:

Corallum reptoid; stolens often covered by incrusting bryozoan. Corallites vary from 2 to 3 mm. in diameters, rarely upto 4 mm. and are 2 to 3 mm. in height. A well developed epitheca completely covers the outer side. Total number of septa 20 to 24. First two cycles of septa very prominent, primaries with 1 or 2 notches, the upper lobulated portion being vertical sometimes rising above the thecal wall. Septal edges weakly dentate; septal sides granular. 12 septa extend to the columella.

Columella well developed fill one-third to half of the calicular bottom; trabecular with papillary projections.

Localities:

Krusadai Island (Gravely, 1927), Manauli Island, Hare Island. It is fairly common on rocks and dead Porites spp.

Distribution:

Gulf of Mannar around Mandapam; Cocos-Keeling Islands (Wells, 1950); Newzealand; Bikini Atoll; Bikini Island.

Remarks:

The smaller size of the corallites of the present specimens when compared to those described from other areas, can be due to the presence of bryozoans, that causes a stunted growth to the coral.

Family OCULINIDAE Gray, 1847.

Characters of the family:

Colonial with non-costate solid or vesicular coenosteum. Septa highly exsert with entire or serrated edges. Asexual reproduction by extratentacular budding. Columella when present papillose.

The family includes two subfamilies as distinguished below.

I. Mostly ahermatypic dendroid colonies with a solid coenosteum. -- Oculininae

II. Hermatypic, ramose or plocoid colonies with a vesicular coenosteum -- Galaxeinae

Members of the subfamily Oculininae is not represented in the present collection. But Cyathohelia axillaris (Ellis and Solander) and Amphihelia morsbyi Alcock, of this subfamily are recorded from the deep waters of India (Alcock, 1898); the former from a depth of 88 fathom off Madras and Kerala coasts and the latter from 444 fathom off Konkan coast.

Subfamily GALAXEINAE Vaughan and Wells, 1943.

This subfamily is represented in the present collection by the well known genus Galaxea.

Genus GALAXEA Oken, 1815.

Galaxea Oken, 1815, Lehrb. Naturg. Th. 3, p. 72.
(cited after Matthai, 1914).

Matthai, 1914, p. 58. (Synonymy).

Genotype - Madrepora fascicularis Linnaeus, 1767.

Generic characters:

Colony plocoid, massive, corallites much projecting, oval, triangular or distorted, united basily by a non-costate, vesicular coenosteum. Septa in 3 to 5 cycles, highly exsert with entire edges. Columella poorly developed.

Two species of this genus are described in this work. Besides these, Gardiner (1904) has recorded G. hexagonalis Milne Edwards and Haime, from Minicoy, among the Indian fauna.

Key to the species of Galaxea described herein.

I. Corallites 1 to 13 mm. in diameters with 4 or 5 cycles of septa. -- Galaxea fascicularis (Linnaeus).

II. Corallites 3 to 4 mm. in diameters, septa in 3 cycles with a few of the fourth. -- G. clavus (Dana).

Galaxea fascicularis (Linnaeus), 1767.

(Pl. XXII, fig. 2).

Galaxea fascicularis Matthai, 1914, p. 59, pl. 8, fig. 4; pl. 16, fig. 4; pl. 34, fig. 3; pl. 38, fig. 1.
(Synonymy).

Vaughan, 1918, p. 98, pl. 33, figs. 2, 3, 3a; pl. 34, fig. 1.

Matthai, 1924, p. 8, pl. 2, fig. 5.

Hoffmeister, 1925, p. 46.

Yabe, Sugiyama and Eguchi, 1936, p. 27, pl. 9, fig. 1.

Umbgrove, 1939, p. 27.

Crossland, 1952, p. 122.

Stephenson and Wells, 1956, p. 41.

Dead and disintegrated corallites of this species are fairly common all along the beach around Mandapam in all localities. Living colonies are not uncommon at Mandapam (Palk Bay) but are usually seen under crevices of rocks. Average sized colonies vary from 15 to 20 cm. in greater diameters. One dead colony at Mandapam (Palk Bay) measured 50 cm. in greater spread. A generalised description of the species based on the present specimens is as follows.

Corallum plocoid, upper surface convex; coenosteum vesicular. Corallites rounded or oval, projecting upto 9 mm. Diameter of corallites 6 to 7 mm.; adjacent ones 4 to 5 mm. apart. Calices about 2 mm. deep. Septa in larger calices in five cycles, the fifth being represented by not more than 6. In smaller ones the total number of septa vary from 40 to 48. Upper parts of septa vertically exsert and narrow at the top of the exsert portion. Edges of septa entire, sides granulose. 12 to 15 septa reach the columella.

Columella narrow, 1 to 2 mm. in length. Outer wall of the corallites costate, costae correspond to septa, becoming less prominent towards the basal parts of the corallites.

A specimen (Pl. XXII, fig. 2) obtained from Chetlat Island has larger calices than the specimens collected at Mandapam. Calices in this specimen are rounded, oval or compressed and elongated; the larger ones upto 13 mm. long and 5 to 6 mm. broad. Septa vary from 40 to 44 in larger calices, major septa upto 3 mm. exsert. 14 to 18 septa extend to the columella.

As already noted by Gravely (1927) and Atoda (1951) the polyps of this species are found expanded during day with their two cycles of tentacles (Horridge, 1957), hanging along the sides of the thecal wall.

Localities:

Mandapam (Palk Bay), Krusadai Island, Chetlat Island.

Distribution:

Red Sea; Somaliland; Madagascar (Pichon, 1964); Seychelles; Maldives; Laccadives; Mandapam; Krusadai Island; Andaman Islands; Mergui Archipelago; Singapore; Philippines; Banda Sea; Amboina; Bay of Batavia; New Caledonia (Wells, 1961); Australia; Murray Island; Ogaswara Island; Ryukyu Island; Fiji; Samoa.

Galaxea clavus (Dana), 1846.

(Pl. XXII, fig. 3).

Anthophyllum clavus Dana, 1846, p. 403, pl. 28, figs. 3, 3a, 3b.

Galaxea musicalis Matthai, 1914, p. 62, pl. 16, figs. 2, 3. (Synonymy).

Matthai, 1924, p. 9, pl. 2, fig. 6.

Thiel, 1932, p. 48, pl. 2, figs. 4, 5.

Yabe, Sugiyama and Eguchi, 1936, p. 27, pl. 9, fig. 2.

Galaxea clavus Vaughan, 1918, p. 99, pl. 33, fig. 1.

Crossland, 1952, p. 122.

Description:

Two small colonies 8 and 5 cm. respectively in greater diameters obtained from Mandapam, along with 2 small fragments from Andaman Islands, are referred to this species.

Coenosteum vesicular. Corallites rounded or oval, 3 to 4 mm. in diameter, 3 to 4 mm. in height. Adjacent corallites 3 to 4 mm. apart at their top, closer towards the base. Septa 20 to 24, rarely upto 28; exsert, exsert ends vertical, swollen at the theca, narrow at the top. Edges of septa entire, sides minutely granular. 12 septa reach the columella.

Columella somewhat solid, small. Costae corresponds to septa, extend towards the base of the corallites.

The species is almost a small edition of G. fascicularis.

Localities:

Mandapam (Palk Bay), Andaman Islands.

Distribution:

Madagascar (Pichon, 1964); Maldives; Ceylon (Ridley, 1883);

Mandapam; Andaman Islands; Mergui Archipelago; Philippines; Torres Strait; Amboina; Palau Islands; Ogasawara Island; Fiji.

Family MERULINIDAE Verrill, 1886.

Characters of the family:

Meandroid or cerioid, hermatypic colonial, with intratentacular polystomodaeal budding. Corallites centres linked by trabeculae. Septa made of one fan system of compound trabeculae. Septal edges regularly dentate. Columella feeble.

Out of the four known genera of this family (Wells, 1956), only Merulina is known among the Indian fauna.

Genus MERULINA Ehrenberg, 1834.

Merulina Ehrenberg, 1834, p. 328.

Matthai, 1928, p. 125. (Synonymy).

Genotype - Madrepora ampliata Ellis and Solander, 1786.

Generic characters:

Corallum foliaceous or ramose, meandroid with continuous rounded collines. Septa slightly exsert, continuous over the colline, with dentate edges. Columella parietal, dense.

Only Merulina ampliata is known from Indian region, of which there are several records from different localities.

Merulina ampliata (Ellis and Solander), 1786.

Madrepora ampliata Ellis and Solander, 1786, p. 137, pl. 41, figs. 1, 2.

Merulina ampliata Matthai, 1928, p. 127, pl. 1, figs. 4 to 6; pl. 13, figs. 1 to 8; pl. 59, figs. 3, 4; pl. 67, fig. 3. (Synonymy).

Thiel, 1932, p. 58, pl. 7, figs. 1, 2, 3a, 3b, 3c.

Yabe, Sugiyama and Eguchi, 1936, p. 41, pl. 29, fig. 3; pl. 5, fig. 6.

Umbgrove, 1939, p. 35.

Crossland, 1952, p. 151.

Stephenson and Wells, 1956, p. 41.

Though broken pieces of this species are seen washed ashore in all localities around Mandapam, living colonies in shallow regions could be seen only at Manauli Island and Hare Island. The largest colony measured was 60 cm. in greater diameter.

Three specimens, all parts from different coralla, have their calicinal surface raised up into knoby prominences, 5 to 6 cm. tall undergoing irregular fusion among themselves. Matthai, (1924) has figured such a specimen in his Plate V, fig. 5.

Valleys long and sinuous with acute or rounded collines. Valleys 2 to 3 mm. wide, when measured from top to top of collines. Collines 1.5 to 2 mm. thick, 2 to 3 mm. in height. Septa 16 to 18 per cm. length of colline out of which 10 to 12 are larger and extend to the centre of the valley. Major septa slightly exsert, exsert ends continuous over the colline, edges dentate, the last

tooth being the largest; septal sides rough. Columella continuous, lamellate with well marked centres.

Non-calicinal surface perforate, with ridges and furrows; costate. Costae spiny.

A cup-shaped corallum with a narrow basal attachment found washed ashore agrees in its characters to Horst's (1921) description of his M. vaughani which Matthai (1928) has shown to be identical with the present species.

Colour:

Living corallum light yellow. Polyps not expanded during day time.

Localities:

Mandapam (Palk Bay), Krusadai Island, Shingle Island (Gravely, 1927), Manauli Island and Hare Island.

Distribution:

A widely distributed Indo-Pacific species, from Red Sea Eastward to Samoa.

Family MUSSIDAE Ortmann, 1890.

Characters of the family:

Solitary and colonial, corallite centres united by lamellae or trabeculae. Septa composed of several fan systems of simple trabeculae, each fan system producing a pronounced lobate tooth. Columella trabecular. Asexual reproduction by intratentacular budding.

Only the genus Symphyllia of this family is considered in this work.

Genus SYMPHYLLIA Milne Edwards and Haime, 1848.

Symphyllia Milne Edwards and Haime, 1848, p. 491.

Genotype - Meandrina sinuosa Quoy and Gaimard, 1833.

Generic characters:

Massive, meandroid, with sinuous, continuous or discontinuous valleys. Valleys 15 to 40 mm. wide, 10 to 30 mm. deep. Collines 3 to 10 mm. thick with or without a middle groove. Septa alternating in size, exsert, edges with large sharp dentition. Columella parietal. Columella centres linked by 1 to 3 horizontal laminae.

Out of the four species (Matthai, 1928) described under this genus, only two are considered in this work, both known previously from Mandapam. The other two viz. S. agaricia Milne Edwards and Haime and S. valenciennesii are not known to this region specifically though the former is reported from Ceylon. The recorded distribution of S. valenciennesii is limited to Mergui Archipelago and eastward in the Pacific.

Symphyllia recta (Dana), 1846.

Symphyllia recta (Dana). Matthai, 1928, p. 227, pl. 30, figs. 1 to 6; pl. 31, figs. 1, 2; pl. 48, figs. 4, 5, 6; pl. 57, figs. 1a, 1b.

Yabe, Sugiyama and Eguchi, 1936, p. 46, pl. 31, fig. 4.

Eguchi, 1938, p. 355.

Umbgrove, 1939, p. 37.

Crossland, 1952, p. 144, pl. 11, figs.2,3.

Symphyllia nobilis Wells, 1954, p. 466.

Stephenson and Wells, 1956, p. 43.

Several specimens were examined during the course of the present investigation, a generalised description of which follows.

Description:

Corallum massive, meandroid with long and sinuous valleys. The lengthiest uninterrupted valley about 18 cm. long; 20 to 28 mm. wide, 10 to 13 mm. deep. Collines 3 to 5 mm. thick in some; and upto 10 mm. in thick in others. A faint groove at the middle of the collines may or may not be present. The sides and bottom of valleys are filled with blistery endothecal vesicles. Septa 7 to 12 per cm. length of colline, out of which 4 or 5 are much thickened. Septa exsert, exsert ends continuous over the collines or stop at the middle of the latter thus alternating. Between two larger septa 1 to 3 smaller septa are usually present. Septal edges dentate, upper 2 or 3 teeth larger than others, and are 2 to 3 mm. long, and about 1 mm. thick at the base. Larger septa extend to the columella.

Columella trabecular, adjacent centres being bridged by 1 to 3 horizontal lamellae having dentate upper edges.

Polyps partly expanded during day, almost filling the valleys. They are brown in colour with brilliant green peristome.

Localities:

Mandapam (Palk Bay), Manauli Island, Hare Island, Krusadai Island (also Gravely, 1927), Andaman Islands. It is a fairly common species here.

Distribution:

Madagascar (Pichon, 1964); Maldives; Laccadives; Palk Bay and Gulf of Mannar around Mandapam; Andaman Islands; Mergui Archipelago; Philippines; Palau Islands; Great Barrier Reef; Murray Island; Queensland; New Caledonia (Wells, 1961); Marshall Islands; Samoa.

Remarks:

Colonies of this species with both thick and thin collines do occur around Mandapam. A thin variety from Mandapam has already been figured by Matthai (1928) in his Pl. 30, fig. 5.

There is no perfect agreement among the different authors with regard to the specific name to be adopted for this species and the species has been differently named simuosa, nobilis and recta. However, in the present work the specific name recta is adopted following Matthai (1928), Yabe, Sugiyama and Eguchi (1936), Eguchi (1938), Umbgrove (1939) and Crossland (1952).

Symphyllia radians Milne Edwards and Haime, 1849.
(Pl. XXII, fig. 4).

Symphyllia radians Matthai, 1928, p. 231, pl. 31, fig. 3; pl. 39, fig. 1; pl. 54, fig. 7; pl. 58, fig. 4; pl. 71, fig. 2.(Literature and Synonymy)
Yabe, Sugiyama and Eguchi, 1936, p. 46, pl. 33, fig. 6.
Umbgrove, 1939, p. 37.
Crossland, 1952, p. 146.

Two specimens are referred to this species.

Description:

Corallum 10 and 15 cm. respectively in greater diameters. Valleys radiating from the centre of the corallum to the periphery. Width of valleys i.e. distance from top to top of collines 18 to 20 mm., their depths being 12 to 15 mm. Collines ridged, 2 to 5 mm. thick. Septa 8 to 10 per cm. length of colline, alternating in size, the larger ones upto 1 mm. thick. Septa exsert, exsert ends continuous over the colline or stopping at the middle of the latter. Septal edges dentate, the upper two or three teeth almost vertical and swollen, They are 2 to 3 mm. in height. Septal faces granular.

Columella trabecular, centres 14 to 20 mm. apart, linked by 2 or 3 horizontal laminae.

Colour:

Living corallum yellow. Polyps brown.

Locality:

Mandapam (Palk Bay). Matthai (1928) has recorded this species from Rameswaram (Gulf of Mannar). The species is not so common as S. recta in this region.

Distribution:

Maldives; Laccadives; Ceylon; Palk Bay and Gulf of Mannar around Mandapam; Singapore; Mergui Archipelago; China Sea; Philippines; Amboina; Sikoku; Kyu syu; Bay of Batavia; Tongatabu; Australia; Thursday Island; Rotuma.

Remarks:

According to Matthai (1928) S. radians differs from S. recta

'in the lobes of the valley retaining the radial arrangement, i.e. lobes radiating from the centre of the calicinal surface to the peripheral, and colonies remaining comparatively small'.

Family PECTINIIDAE Vaughan and Wells, 1943.

Characters of the family:

Mainly colonial, fixed, explanate or foliaceous, rarely submassive, Corallites level, a definite wall usually absent, sometimes with projecting walls; septa formed of one fan system of compound trabecula; septal edges irregularly dentate. Columella trabecular. Asexual reproduction by intratentacular polystomodaeal budding, corallites remaining connected by lamellae.

Out of the five genera of this family known throughout the Indo-Pacific (Wells, 1956), only one viz. Mycedium is represented in the present collection.

Genus MYCEDIUM Oken, 1815.

Mycedium Oken, 1815, Lehrb. Naturges. 1, p. 68. (cited after Matthai, 1924).

Genotype - Madrepora elephantotous Pallas, 1766.

Generic characters:

Colonial, spreading, explanate, margin raised up in contorted folia forming clumps, corallites protuberant, nariform, inclined towards the growing margin of the colony. Coenosteum costate.

According to Wells (1956) the genus is probably monotypic. The present record of the genus is new to India.

Mycedium tubifex (Dana), 1846.

(Pl. XXII, fig. 5).

Phyllastrea tubifex	Dana, 1846, p. 270, pl. 16, fig. 4.
Mycedium tubifex	Yabe, Sugiyama and Eguchi, 1936, p. 49, pl. 37, figs. 3, 4.
	Umbgrove, 1939, p. 40, pl. 9, figs. 1, 2.
	Stephenson and Wells, 1956, p. 44.
Mycedium okeni	Matthai, 1924, p. 58, pl. 3, fig. 6.
Mycedium aspera	Matthai, 1924, p. 58, pl. 3, fig. 5; pl. 7, fig. 2.
Mycedium elephantotus	Yabe, Sugiyama and Eguchi, 1936, p. 49, pl. 33, fig. 4; pl. 37, figs. 5, 6.
Mycedium tenuicostatum	Yabe, Sugiyama and Eguchi, 1936, p. 50, pl. 37, figs. 7, 8.

Part of a worn out corallum found washed ashore is all that represents the species in the present collection.

Description:

Corallum a thin folia 9 cm. in greater diameter, with very thin edges, thickening to 6 mm. at the broken edge. Under side, i.e. the non-calicinal surface is marked by small ridges corresponding to costae.

Corallites projecting, nariform, inclined towards the periphery of the corallum; 10 to 11 mm. in diameter, 6 to 8 mm. in height when measured at the projecting side. Septa 20 to 24,

alternating in size; thickened at the wall, major ones reaching the columella. Edges of septa with remnants of 2 to 3 teeth, but not preserved in some calices.

Costae correspond to septa; alternating in size, continuous from corallite to coralliite. Columella formed of twisted trabeculae. Other details if any, could not be worked out in the present specimen.

Locality:

Mandapam (Palk Bay).

Distribution:

Madagascar; Mandapam; Singapore (Purchon, 1956); Mergui Archipelago; Bay of Batavia; Great Barrier Reef - Low Isles; Palau Islands; Fiji.

Remarks:

The species treatment adopted here is that of Stephenson and Wells (1956).

Suborder CARYOPHYLLIINA Vaughan and Wells, 1943.

This suborder comprises two superfamilies - Caryophylliicae and Flabellicae - the former with a septothecal and latter with an epithecal wall. Only the superfamily Caryophylliicae is represented in the author's collection.

A list of genera and species of deep sea caryophyllina known from the seas around India, other than those described in this work is presented below.

Superfamily Caryophylliicae

Family Caryophylliidae

Family Caryophylliinae

Genus Caryophyllia Lamarck

C. clavus (Scacchi). Alcock (1898) recorded this species from Kerala coast (410 fathom).

C. ambrosa Alcock. Alcock (1898) described this species from Laccadive seas (1000 to 1090 fathom).

C. ephyla Alcock, 1891. Alcock (1898) has recorded this species off Madras coast (107 fathom).

C. paradoxus Alcock. Alcock (1898) has described it from Kerala coast (430 fathom).

C. (Acanthocyathus) grayi Milne Edwards and Haime. Alcock (1893, 1898) has reported this species from the Andaman seas (185 fathom).

Genus Deltocyathus Milne Edwards and Haime.

D. andamanicus Alcock. Alcock (1898) from Andaman seas (172 to 303 fathom)

Genus ? Polycyathus Duncan.

P. andamanensis Alcock, 1893, from Andaman seas.

Genus Heterocyathus Milne Edwards and Haime

H. aequicostatus Milne Edwards and Haime. Alcock (1893) has recorded this species from the Andaman seas; and Bourne (1905) from Ceylon.

H. wood-masoni Alcock, 1893 from Andaman seas.

Genus Stephanocyathus Seguenza

S. nobilis (Mosely). Alcock, (1898) has recorded this species off Goa coast (740 fathom) and Laccadives.

Genus Tropidocyathus Milne Edwards and Haime

T. herdmani (Bourne). Bourne (1905) described this species from Ceylon.

Subfamily Desmophyllinae Vaughan and Wells.

Genus Desmophyllium Ehrenberg.

D. vitreum Alcock, 1898. From Kerala coast (430 fathom).

Genus Lophelia Milne Edwards and Haime

L. investigatoris (Alcock), 1898. From Kerala coast (430 fathom).

L. sp. Alcock, 1893 off Konkan coast (446 fathom).

Subfamily Parasmiliinae Vaughan and Wells.

Genus Solenosmilia Duncan, 1873.

S. jeffreyi Alcock, 1898. Off Kerala coast (430 fathom).

Superfamily Flabellicae Bourne, 1905.

Family Flabellidae Bourne, 1905.

Genus Flabellum Lesson, 1831.

F. crassum Milne Edwards and Haime. Bourne (1905) has recorded this species from Gulf of Mannar.

*F. rubrum Quoy and Gaimard. From Ceylon (Bourne, 1905).

F. pavonium Lesson. Alcock (1898) has recorded this species as F. paripavonium.

F. deludens Marenzeller, 1904. Alcock (1898) has reported this species as F. lacinatum from Bay of Bengal (400 to 600 fathom).

F. japonicum Mosely. Alcock (1898) from the Indian seas (400 to 700 fathom).

F. crateriformis (Alcock) 1893. From Coromandal coast (573 fathom).

*According to Squires (1963) the specimen described by Bourne (1905) do not belong to F. rubrum Quoy and Gaimard.

Genus Placotrochus Milne Edwards and Haime.

P. laevis Milne Edwards and Haime. Bourne (1905) has recorded this species from Ceylon.

Superfamily CARYOPHYLLIICAE Gray, 1847.

Family CARYOPHYLLIIDAE Gray, 1847.

Characters of the family:

Solitary and colonial, mainly ahermatypic; in colonial forms extratentacular budding results in phaceloid or dendroid coralla. Septa laminar, exsert, with smooth or serrated edges. Pali Usually present. Columella solid, papillose or spongy.

Synopsis of the characters of the subfamilies of Caryophylliicae considered herein.

I. Solitary or colonial, ahermatypic with extratentacular budding. Costae prominent. Columella trabecular or papilliform. -- Caryophylliinae

II. Colonial, phaceloid or meandroid; budding intratentacular. Costae low. Columella lamellar or trabecular. Sometimes absent. -- Eusmiliinae

Subfamily CARYOPHYLLIINAE Gray, 1847.

Characters of the subfamily:

"Mostly solitary, fixed or free; ahermatypic. Phaceloid or dendroid colonies formed by extratentacular budding from edge zone. Septothecate, with strong costae. Endothecal dissepiments rare" (Wells, 1956, p. 422).

Genus TROCHOCYATHUS Milne Edwards and Haime, 1848.

Trochocyathus Duncan, 1885, p. 22 (literature and Synonymy).

Genotype - Turbinolia mitrata Goldfuss, 1827.

Duncan (loc. cit.) defined the genus thus:

"The corallum is simple, pedunculate or subpedicillate, or merely shows the trace of a former adhesion. The shape may be elongate, turbinate, subturbinate, straight, curved, compressed or not, or more or less discoid and flat. The calice is deep or widely open. The septa are long and usually some are exsert. The pali are in two crowns. The columella is formed of trabeculae is essential, and may or may not be papillary. The costae may or may not be well developed, crested, spined or simply projecting. Epitheca variable".

Trochocyathus sp.

(Pl. XXII, fig. 6).

Description:

Nine specimens were collected during the present investigation. The details of measurements, septal numbers; and their habitat are given in Table VII.

Corallum with an expanding base, usually attached to the under surface of other hermatypic corals. Basal expansion upto 20 mm. Calices rounded or oval, their diameters and depth as given in Table VII. Septa in five cycles, the fifth usually incomplete. The first three cycles almost equally prominent and are exsert to a maximum of 1 mm. Exsert ends of septa arched to the outer side and continuous with the costae. Other cycles of septa less exsert and often join to the sides of the lower cycles

towards the bottom of the calyx. Larger septa project about a mm. into the calyx. Edges of septa entire, sides with prominent spinulations.

TABLE VII

Details of measurements of Trochocyathus sp.

S. No.	Height in mm.	Greater diameter at the top in mm.	Depth of calyx in mm.	Total No.of septa	Remarks on habitat
1.	8.0	9.0	4.0	80	From Acropora erythraea. Base expanding.
2.	6.0	6.0	2.5	68	From A. surculosa. One side of the base descent down and enclose the substratum.
3.	11.0	6.0	3.0	58	From A. surculosa.
4.	3.0	5.0	2.0	52	A young specimen from the under side of a folia of Montipora foliosa.
5.	4.0	7.0	2.5	68	From Acropora multicaulis.
6.	6.0	9.0	4.0	82	Nos. 6 and 7 are found closely attached on a Porites, their bases fused at the middle.
7.	4.0	8.0	4.0	69	
8.	9.0	8.0	5.0	72	From Favia pallida.
9.	13.0	11.0	6.0	80	From the dead stem of a sea grass found washed ashore.

Costae moderately prominent and extend to the base of the corallite. They are close together, subequal, larger and smaller ones alternating. Costae covered by numerous, small granulations. Pali in two crowns, those at the end of the first three cycles of septa much prominent. Columella essentially trabecular with numerous papillary projections.

An epitheca is absent.

Colour:

Outer side of the corallum dull white. Interior of the calyx dark purplish brown in older ones. In young coralla only the edges of septa is coloured.

Localities:

Manauli Island (nos. 1 to 5), Hare Island (nos. 6 and 7), Pamban (no. 8), Mandapam (Gulf of Mannar) (no. 9).

Remarks:

Gravely (1927) has recorded an undetermined species of Trochocyathus from the littoral waters of Krusadai Island and from Under the Pamban Bridge; remarking that "it reaches a height of about 10 mm. with a breadth of about 13 mm. at the top and 21 mm. at the bottom. The outer wall is white; contrasting strongly with the septa which are dark purplish brown". It appears that this species is hitherto undescribed.

Genus PARACYATHUS Milne Edwards and Haime, 1848.

Paracyathus Milne Edwards and Haime, 1848, Ann. Sci. nat. (3) IX, p. 318.

Paracyathus Duncan, 1885, p. 24.

Genotype - Paracyathus procumbens Milne Edwards and Haime, 1848.

Generic characters:

Corallum usually solitary, turbinate, fixed, pali in several crownes, merging with the papillae of the columella. Epitheca present or absent. Asexual reproduction by extratentacular budding from edge zone.

The genus is closely allied to Trochocyathus Milne Edwards and Haime. According to Alcock (1902) it differs from Trochocyathus only in having the pali that are confused with the columella.

The members of this genus are chiefly deep sea forms; though a few are known to inhabit littoral waters. There are records of the following species of this genus from the deep waters of this part of the Indian ocean. Alcock (1893) has described P. porphyreus dredged off Arracan Coast along with P. andamanensis from the Andaman sea. Duncan (1889) has described 5 new species, viz. P. indicus, P. profundes, P. andersoni, P. coeruleus and P. merguiensis from the Mergui Archipelago. The depth at which they are collected was not mentioned. Gardiner (1905) has recorded P. parvulus and P. lifuensis from Maldives, the last mentioned from a depth of 20 fathom and more. Bourne (1905) has recorded P. stokesi Milne Edwards and Haime and P. striatus Philippi from the deep waters of Galle, Ceylon. Out of a total of 30 or more species assigned to this genus (Gardiner and Waugh, 1938) how many are really valid is doubtful.

The present collection includes a single shallow water species of this genus, as identified below.

Paracyathus parvulus Gardiner, 1899.

(Pl. XXIII, fig. 1).

Paracyathus parvulus Gardiner, 1899, p. 165, pl. 19, figs.4a, 4b.
Gardiner, 1905, p. 956, text fig. 143.
Wells, 1954, p. 469, pl. 177, figs. 3, 4.

Description:

Corallum solitary, the largest corallite collected was 4.5 mm. in diameter with a height of 8 mm. Generally they are 2.5 to 3.5 mm. in diameter with a height of 3 to 5 mm. An epitheca is present, sometimes reaching to the top of the wall; but generally stopping at mid-height of the wall. Rarely two corallites may undergo fusion all along their height.

Calices rounded or oval, moderately deep; septa in four cycles the fourth incomplete, represented by 10 to 14 in different calices. Septa exsert, higher the cycle lesser the exsertness; exsert ends arched. Septal edges minutely serrated or appears entire. Septal sides spinulose.

Pali of the first two cycles of septa better developed; those of the third cycle stand a bit back from the level of those of the primaries and secondaries. Columella with 8 to 12 papillae, merging with the palar crown.

Costae correspond to septa those of the first two cycles of septa larger, others smaller with numerous small rounded granules throughout the length.

Localities:

Manauli Island, Hare Island, Tuticorin. It is a fairly common species seen attached to reef rocks.

Distribution:

Maldives; Manauli Island; Hare Island; Tuticorin; Lifusandal Bay; Marshall Islands.

Subfamily EUSMILIINAE Milne Edwards and Haime, 1857.

Characters of the subfamily:

Colonial, hermatypic, with septothecal or parathecal wall. Costae low, but distinct. Septa exsert. Columella trabecular, lamellar or totally wanting. Endothecal dissepiments vesicular. Asexual reproduction by means of intratentacular di to polystomodaeal budding.

Four living genera of this subfamily, viz. Euphyllia Dana, Plerogyra Milne Edwards and Haime, Physogyra Quelch and Gyrosmilia Milne Edwards and Haime are known from the Indo-Pacific, out of which only Euphyllia is so far recorded from India (Minicoy).

Genus EUPHYLLIA Dana, 1846.

Euphyllia Dana, 1846, p. 157.
Matthai, 1928, p. 173.

Genotype - Caryophyllia glabrescens Chamisso and Eysenhardt, 1821.

Generic characters:

Corallum phaceloid, branches free throughout their length, calices either monostomodaeal or form short valleys; large and deep. Septa thin with entire edges and smooth or minutely rough sides. Columella absent. Costae correspond to septa.

The collection includes a single species of this genus as identified below - the only recorded species of this genus from India.

Euphyllia glabrescens (Chamisso and Eysenhardt), 1821.

(Pl. XXIII, figs. 2, 3).

Euphyllia glabrescens Vaughan, 1918, p. 82, text fig. 1; pl. 26, figs. 2, 3, 3a. (Synonymy).

Matthai, 1924, p. 34.

Matthai, 1928, p. 174, pl. 3, figs. 17 to 21; pl. 42, fig. 5, pl. 44, fig. 4; pl. 62, fig. 9.

Yabe, Sugiyama and Eguchi, 1936, p. 17, pl. 8, fig. 5.

Crossland, 1952, p. 104, pl. 2, fig. 6.

Wells, 1954, p. 471.

Nemenzo, 1960, p. 209, pl. 1, fig. 1.

Two colonies 14 and 15 cm. respectively in greater spread and 12 and 8 cm. respectively in total height are referred to this species.

Description:

Calices mono to tristomodaeal; the largest monostomodaeal corallite about 20 mm. in greater length. Length of largest valley 40 mm. Calices average 15 mm. deep, in some cases upto 20 mm. Thecal wall very thin, fragile. Septa per centimeter length of valley range from 13 to 17 out of which 4 or 5 are 5 to 6 mm. broad. Septa scarcely exsert, narrow and vertical at the top, broader below with entire edges and spinulose sides.

Columella not visible. Costae of the major septa prominent, extend to the base of the branch; those of the smaller septa obsolete.

Localities:

Chetlat Island, Minicoy.

Distribution:

Somaliland (Gravier, 1911); Mauritius; Maldives; Laccadives; Ceylon; Mergui Archipelago; Singapore; Philippines; Torres strait; Rotuma; Murray Island; Amboina; Fiji; Marshall Islands; Samoa.

Suborder DENDROPHYLLIINA Vaughan and Wells, 1943.

This suborder includes only a single family - Dendrophylliidae.

Family DENDROPHYLLIIDAE Gray, 1847.

Characters of the family:

Solitary and colonial, with costate porous wall. Septa composed of one fan system of simple trabeculae. Edges of septa weakly dentate, sides granular. Septa follows 'Pourtales plan' either throughout or only at the early stages. Columella trabecular, spongy or absent. Colony formation by both intra and extra tentacular budding.

Besides the three genera of this family described in detail in this work, the following are also known from the seas around India.

Name	Locality	Reference
Genus Balanophyllia.		
B. imperialis Sav. Kent.	Ceylon.	Alcock (1893).
B. parallela (Semper)	Andaman sea Ceylon.	Alcock (1893). Bourne (1905).
B. affinis (Semper)	Andaman Sea and Ceylon.	Alcock (1893).
B. cumingii Milne Edwards and Haime	Ceylon	Bourne (1905).
B. taprobane Bourne	Galle, Ceylon.	Bourne (1905).
B. scabra Alcock	Andaman sea	Alcock (1893).
Genus Heteropsammia		
H. michelini Milne Edwards and Haime.	Ceylon	Bourne (1905).
H. geminata Verrill.	Andaman sea	Alcock, (1893).
H. cochlea (Spengles)	Ganjam coast	Alcock (1893).

Key to the genera of the family Dendrophylliidae described herein.

I. Solitary, fixed, cylinderical. Pourtales-plan of septa seen only in early stages.

-- Endopsammia Milne Edwards and Haime.

II. Colonial, dendroid. Septa retain Pourtles-plan in adult condition. -- Dendrophyllia de Blainville.

III. Colonial, corallum variously shaped. Corallites united by coenosteum, nearly to their summit.

-- Turbinaria Oken.

Genus ENDOPSAMMIA Milne Edwards and Haime, 1848.

Endopsammia Milne Edwards and Haime, Ann. sci. Nat. (3) X, p. 91.

Genotype - Endopsammia philippinensis Milne Edwards and Haime,1848.

Generic characters:

Corallum small, solitary, fixed, wall thin, costate and porous. Septa thin, follow the Pourtales-plan only in early stage. Columella week, coral eosin red in living condition.

The genus according to Wells (1964) differs from Balanophyllia Wood, by its "septal arrangements which is 'normal' in the adult stages, instead of the specialized Pourteles plan of Balanophyllia".

A single species is considered herein.

Endopsammia philippinensis Milne Edwards and Haime, 1848. (Pl. XXIII, fig. 4).

Endopsammia philippinensis Wells, 1964, p. 118, pl. 2, figs. 12,13. (literature and Synonymy)

Thecopsammia regularis Gardiner, 1899, p. 169, pl. 19, figs. 8a, 8b.

Balanophyllia regularis Horst, 1926, p. 50, pl. 3, figs. 10, 11.

Description:

Seven specimens, all found attached to the upper surface of a colony of Acropora surculosa, are referred to this species. The details of measurement and their septal numbers of the corallites are tabulated in Table VIII.

TABLE VIII

Measurements and septal numbers of specimens of E. philippinensis

S. No.	Greater diameter of the base in mm.	Height of corallum in mm.	Diameter of the calyx in mm.	Total number of septa
1.	7.5	6.0	6.0	47
2.	5.0	5.0	6.0	42
3.	5.0	6.0	6.0	48
4.	8.0	4.0	6.0	40
5.	9.0	6.0	5.0	42
6.	10.0	4.0	5.0	42
7.	5.0	3.0	4.0	30

Corallum solitary, cylindrical. An epitheca present. Calices rounded or oval, very shallow. The primary and secondary cycles of septa much thickened. Septa scarcely exsert. 14 to 18 septa extend to the columella; others fuse to the sides of the lower cycles. Sides of septa highly granular; but their edges remain almost entire. The coarse granulations on the septal sides considerably obstruct the interseptal loculii.

Columella well developed, trabecular with 2 to 3 papilliform projections. Thecal wall porous. Costae well developed at the top of the corallite but become less prominent towards the base. Costae with a single row prominent pointed spine.

Colour:

The polyps and corallum displayed an eosin red colour in living condition.

Locality:

Manauli Island.

Distribution:

Zanzibar; Maldives; Salomon; Manauki Island; Philippines; Queensland; Lufu-sandal Bay.

Genus DENDROPHYLLIA de Blainville, 1830.

Dendrophyllia de Blainville, 1830, Dict. Nat. Sci., lx, p. 39.

Genotype - Madrepora ramae Linnaeus, 1758.

Generic characters:

Colonial, dendroid. Colony formation by extratentacular budding. Corallites large and deep. Wall porous and costate. Septa follow Pourtales plan. Columella small.

Three species of this genus are considered in this work, out of which one, however, is described as new to science. Besides those that are described in this work, Alcock (1893) has described the occurrence of a species of Dendrophyllia at the Orissa coast among the Indian fauna. Bourne's account of the solitary corals of Ceylon includes D. minuscula Bourne, 1905 and D. Gracilis Milne Edwards and Haime.

Dendrophyllia aurea (Quoy and Gaimard), 1833.

(Pl. XXIII, fig. 5).

Dendrophyllia aurea Horst, 1926, p. 46, pl. 2, figs. 1 to 4, 8, 9. (literature and synonymy).

Description:

Several specimens were collected during the present investigation. The largest colony in the collection is about 5 cm. in

greater spread, the smallest being a single corallite with three small buds at the base.

Corallites arise from an encrusting base. Fully developed corallites 6 to 8 mm. in diameter, 5 to 6 mm. deep and upto 10 mm. in height. Septa in three cycles, rarely with a few of the fourth cycle. The primaries are the broadest and are a bit exsert. Septa of uniform width throughout their length. Edges of septa entire, sides granular. Twelve septa reach the columella.

Columella trabecular, rudimentary.

Costae sinuous, extend to the base of the corallites, adjacent ones being united by transverse connections, between which the perforations of the wall can be made out. Costae with one or two rows of rounded granules throughout their length. An epitheca absent.

Colour:

Eosin red in living condition.

Localities:

Manauli Island, Hare Island. Usually found attached to semifossilised or dead colonies of Porites.

Distribution:

Red Sea; Madagascar (Pichon, 1964); Maldives; Manauli Island; Hare Island; Singapore (Purchon, 1956); Mergui Archipelago; Cocos-Keeling Islands; Hawaii; Panama; Kei Islands.

Remarks:

The species treatment adopted here is that of Horst (loc.cit.)

the identification being mainly based on Gardiner's (1900) description and figures of his Coenopsammia willeyi.

Dendrophyllia robusta (Bourne), 1905.

Lobopsammia robusta	Bourne, 1905, p. 212, pl. 2, figs. 10, 10a.
Dendrophyllia robusta	Harisson and Poole, 1909, p. 909, pl. 86, fig. 6.
	Gardiner and Waugh, 1939, p. 235.
Dendrophyllia coccinea	Horst, 1922a, p. 55, pl. 8, fig. 21.
Dendrophyllia klunzingeri	Horst, 1926, p. 46.
?Dendrophyllia erecta	Nemenzo, 1960a, p. 19, pl. 1, fig. 1.

Description:

Two small colonies found attached to a rock are referred to this species. The larger colony is 28 mm. in total height with 5 corallites radiating from the main stem which is 15 mm. thick. The small colony is only 15 mm. in height, with a single corallite bearing two buds. The smallest corallite is 6 mm. in diameter with two cycles of septa. The larger corallites are upto 12 mm. in diameter, about 10 mm. deep and are upto 15 mm. in height with four complete cycles of septa. 12 to 18 septa extend to the columella.

The first two cycles of septa are large, not exsert. Upper portions of the septa narrow and sloping, later getting broadened and then discending vertically. Edges of septa entire or with microspopic serrations in higher cycles, sides of septa granulose.

Columella spongy, convex, circular or elongated 4 or 5 mm. in diameter.

Costae prominent, wavy, extend to the base of the stem; united by transverse ridges between which the pores of the thecal wall are visible. A single row of rounded granules present along the length of the costae.

A specimen preserved in the Museum of Krusadai Island Biological Station is having a central stem 28 mm. thick at its base with a total height of 8 cm. 11 corallites radiate from the main stem. Corallites vary from 9 to 19 mm. (majority between 17 and 19 mm.) in diameters and 10 to 20 mm. in depth (usually about 15 mm.). Height of corallites vary from 16 to 35 mm. A calyx 9 mm. in diameter possesses 50 septa whereas one 19 mm. in diameter possesses 118 septa. In others the septa vary from 95 to 105. Other details of the specimen as in the previous.

Colour:

Living corallum reddish brown.

Locality:

Hare Island. The species is rare in the littoral waters around Mandapam.

Distribution:

Maldives; Ceylon; Hare Island; Mergui Archipelago; ? Philippines.

Dendrophyllia indica sp. nov.

(Pl. XXIII, fig. 6; Pl. XXIV, figs. 1, 2).

Description of the holotype (Pl. XXIV, figs. 1, 2).

Corallum arborescent. A branch 18 cm. in height has a basal thick[illegible] of 4 cm. at the broken edge. The main stem

bifurcates almost at its mid-height; the tip of one of the branches being slightly flattened.

Corallites arranged all around the main stem and the branches; adjacent ones being 10 to 15 mm. apart. Corallites are placed at different angles to the long axis of the stem, a few being at right angles; and are projecting 10 to 12 mm. Calices rounded, generally 10 mm. in diameter, a few are smaller only 8 mm.; and are 7 to 8 mm. deep. Septa in four complete cycles. Rarely there may be 50 or 52 septa in larger calices. The fourth cycle of septa from either side always fuse to the third cycle at the mid-depth of the calyx. Septa very narrow, non-exsert, obsolete at the wall, vertically descending. The primaries are the broadest and are about a millimeter broad, others still narrower. Septal edges entire, sides granular.

Columella formed of loose trabeculae, not projecting, 4 to 5 mm. broad.

Wall of the corallite moderately porous at the top, dense below. Costae wavy, extend to the base, intercostal spaces narrower than the costa. Spinulations on the costae small, rounded and scattered. Surface of the branches ridged, moderately porous.

The specimen was obtained in a washed and dried condition.

A second specimen which is designated as the paratype of this species has got the following characters (Pl. XXIII, fig. 6).

It is a young, entire, club-shaped corallum, with a

greater diameter of 28 mm., starting from a narrow base. The colony has a total height of 30 mm. with 14 corallites. Corallites very little projecting, sometimes upto 2 mm. Larger calices 8 to 9 mm. in diameter about 5 mm. deep, with newly formed smaller ones in between. Septal and other characters as in the holotype.

Locality:

Both the specimens were obtained from the Pearl Banks of Tuticorin. The depth at which they were collected is not exactly known.

Remarks:

The present species appears to be very near to D. boschmi Horst, 1926, especially in the size of the calices. But Horst's species possesses exsert septa (Horst, 1922a) quiet unlike the present. Further the arrangement of the septa and their number reaching the columella are quiet different in the present species. The less elevated corallites of the paratype seems to be due to the fact that they have not yet attained their full size since the corallum is young and has not attained the adult arborescent condition.

Genus TURBINARIA Oken, 1815.

Turbinaria Oken, 1815, Lehrb. Natur. iii, p. 67. (cited after Vaughan and Wells, 1943).

Genotype - Madrepora crater Pallas, 1766.

Generic characters:

Colonial, explanate, massive, crateriform or foliaceous. Corallites united nearly to their top by coenosteum. Coenosteum usually with a well defined system of ridges and furrows.

Corallites level or projecting, usually wide apart. Columella well developed.

The genus is not a dominant element among the hermatypic corals around Mandapam; though colonies are occasionally met with. Gravely (1927) has reported T. crater (Pallas), T. peltata (Esper), T. patula (Dana) and T. frondens (Dana) from Krusadai Island and its vicinites. T. patula (Dana) was shwon to be identical with T. peltata (Esper) by Umbgrove (1939); while Gravely's record of T. frondens is rather doubtful. The present collection includes 4 species of Turbinaria, out of which T. quincuncialis Ortmann was obtained from Tuticorin. The others were collected around Mandapam.

Turbinaria crater (Pallas), 1766.

Madrepora crater Pallas, p. 332.

Turbinaria crater Bernard, 1896, p. 23, pl. 1; pl. 31, fig. 1.
Umbgrove, 1939, p. 54.
Wells, 1954, p. 471.

Description:

Corallum cup-shaped, with a narrow stalk. Greater diameter at the top of the cup 9.5 cm. Depth 6cm. Corallites are confined to the interior of the cup; where they are arranged in wavy concentric rows. Distance between adjacent rows 3 to 5 mm. Corallites within a row almost touching to 2 mm. apart, very little projecting and are moderately deep. Septa 16 to 24 generally between 16 and 18. Septa projecting one-third to half of the radius circle. Columella small, thin and ridge like. Coenenchyme granular without well developed ridges and furrows.

Locality:

The single specimen in the present collection was found washed ashore at Krusadai Island in a partly decayed condition. Gravely (1927) has recorded this species from Shingle Island.

Distribution:

Madagascar (Pichon, 1964); Gulf of Mannar; Western Australia; Bay of Batavia; Torres Strait; Amboina; Marshall Islands.

Turbinaria quincuncialis Ortmann, 1889.

(Pl. XXIV, fig. 3).

Turbinaria quincuncialis Ortmann, 1889, p. 497.

Bernard, 1896, p. 36.

Description:

Corallum crateriform, the entire colony was said to be about 50 cm. in greater spread. A part measures 15 cm. in length (original height of the cup) and 8 cm. in width. The growing edges only 2.5 mm. thick, but it becomes 7 to 8 mm. thick lower down. The corallites are seen only at the innser side of the cup.

Corallites irregularly distributed, adjacent ones 1 to 3 mm. apart; obliquely projecting to a maximum of 1 mm. Top of corallites narrower than the base. Calices oval or elliptical, 1 to 1.5 mm. in diameter, about 1 mm. deep with thin walls. Septa generally 16 rarely 17 or 18. First two cycles subequal, projecting half to the radius circle of the calyx. Edges of septa with 5 or 6 small teeth; septal sides granular. Columella rudimentary; deep seated; represented by one or two papilliform projections.

Coenenchyme under the lens reveals, numerous, closely set,

vertical thin plates with sharp spines at their edge. Between the plates the coenenchyme is porous. Outer side of the cup i.e. the non-calicinal surface with small ridges but not so coarse as they are on the calicinal surface.

Locality:

Tuticorin.

Distribution:

Ceylon; Tuticorin.

Remarks:

Ortmann (loc. cit.) has unfortunately left no figure of this species. Nothing is further known of this species, though Bernard (1896) has summarised its characters. The present specimen agrees Ortmann's description in all respects. The species differs from T. crater in its irregularly distributed, obliquely projecting calices and lesser number of septa and comparatively rudimentary columella.

Turbinaria peltata (Esper), 1797.

(Pl. XXIV, fig. 5).

Madrepora peltata Esper, 1797, p. 27, pl. 42.

Turbinaria peltata Bernard, 1896, p. 38, pls. 6, 7, 8; pl. 31, fig. 5.

Ma, 1937, pl. 78, fig. 4; pl. 81, figs. 1 to 3.

Umbgrove, 1939, p. 54.

Crossland, 1952, p. 174, pl. 14, fig. 1; pl. 16, figs. 4, 5; pl. 17, fig. 1; pl. 18, figs. 1, 2; pl. 19, fig. 2; pl. 22, fig. 2.

Nemenzo, 1960a, p. 4, pl. 1, fig. 1.

This most striking and widespread species is not uncommon around Mandapam. Five colonies were collected, which form a series when arranged, illustrating the different stages of the growthform of the species. The smallest specimen in the collection is in the form of an inverted cone with a narrow base, the top of which is flat and bearing 18 calices. Two other specimens are almost shield-like, with an expanded attachment area. They measure 7 and 15 cm. in greater diameters respectively; the larger one with a tendency to get folded upto at its edges. The other two specimens are large, thick, explanate plates 55 and 50 cm. (measured in the field) respectively in greater diameters with a thickness of upto 4 cm.

In the first three colonies the corallites are level, or with slightly projecting wall on one side. Calices 6 to 7 mm. in diameter, about 3 mm. deep. In the larger specimens, the corallites exhibit wide range of variation both in their size and elevation. For a considerable area, the corallites are only 4 mm. or less in diameter, but in other parts they are larger. In certain parts of the corallum the corallites are projecting upto 5 mm. (Pl. XXIV, fig. 5) as was described by Crossland for his variety gibiari.

Three complete cycles of septa; sometimes with a few of the fourth cycle, are seen. Primaries and secondaries subequal in width. Septa narrow at first, getting broader below; not exsert. Edges of septa entire or minutely serrated, sides granular.

Columella foliate, convex, almost filling the bottom of the cup. Coenenchyme with a well defined system of ridges and furrows.

The polyps are found readily expanded during day time, both in the field and in the laboratory. Fully expanded ones are 5 to 6 mm. in height and 7 to 10 mm. in diameter including the tentacles.

Locality:

Mandapam (Gulf of Mannar and Palk Bay).

Distribution:

Mauritius; Ceylon; Mandapam; Singapore; Batavia; Philippines; Taiwan (Kawaguti, 1953); Pratas Island; Great Barrier Reef; Marshall Islands.

Remarks:

It is interesting to note that the larger specimens in the present collection show corallites of typical T. peltata, T. peltata var. gibiari and T. patula (Dana). Umbgrove (1939) has already referred T. patula and T. maxima Ortmann to the synonymy of T. peltata Esper. Judging from the present specimens, it appears that Crossland's (1952) var. gibiari represents only the final stage of growth of this species. It may be remembered that Crossland found his variety on a fragment.

Turbinaria mesenterina (Lamarck), 1816.

(Pl. XXIV, fig. 4).

Explanaria mesenterina Lamarck, 1816, p. 255.

Turbinaria mesenterina Bernard, 1896, p. 57, pl. 15; pl. 32, fig. 10.

Gravier, 1911, p. 65, pl. 8, fig. 37; pl. 10, fig. 41.

Waugh Peggy, 1936, p. 921, pl. 1; pl. 2, figs. 2, 2a, 3. (Synonymy).

Wells, 1954, p. 472.

Description:

Two specimens are referred to the species. The larger colony is about 30 cm. in greater spread. It is composed of vertical fronds, the edges of which are folded inwardly in such a way as to form, short, thick, hollow cylinders the top of which later get completely sealed. Growing edges of the fronds very thin, with a row of newly formed corallites. Corallites obliquely projecting upto 2 mm. with a thickened wall. Distance between adjacent corallites 1 to 2 mm. Calices circular or oval in outline, moderately deep, 1.5 to 2 mm. in diameter. Septa usually 20, subequal in size, vertically descending with entire edges and granulose sides.

Columella oval, about a mm. in diameter, spongy; projecting with a medium, thin ridge.

The surface coenenchyme shows a well defined system of ridges and furrows, the former with small, sharp echinulations.

The second specimen is a young encrusting plate 10 x 7 cm. in greater diameters. The growing edge has not yet started its usual upward growth.

Polyps not found expanded during day.

Locality:

Manauli Island. The species is not common here.

Distribution:

Red Sea; Somaliland; Rodriguez; Manauli Island; Great Barrier Reef; Caroline Island; Bikini Atoll.

Remarks:

It is one of the highly variable members of the genus. Waugh Peggy (*loc. cit.*) after an intensive study of the genus from the Red Sea has come to the conclusion that at least eight of the previously described species by various workers from that area, are only variations of one and the same. The species is well known for the immense size that its colonies may attain. Bell (1895) has reported on two such large specimens kept in the British Museum 'which occupy irregularly shaped areas, the boundaries of which are respectively 16 ft. and 16 ft. 8 inches'.

I. ECOLOGY OF THE CORALS OF MANDAPAM

Mandapam (long. 79° 9' E, lat. 9° 17' N) is situated on a narrow strip of land on the south-eastern coast of the Indian peninsula, and is linked to the Rameswaram Island by the rail bridge across the Pamban Pass. The present ecological study mainly pertains to the reefs in Palk Bay side of Mandapam (Pl. I, fig.2); though a additional observation were also made on the reefs of the various Islands in the Gulf of Mannar near Mandapam.

Physical and hydrographic conditions

Mandapam is bounded by the waters of Palk Bay on the north and those of Gulf of Mannar on the south. Palk Bay is a rather land-locked shallow basin, the depth of which nowhere exceeds 15 meters - on an average not more than 9 meters - (Murthy and Varma, 1964), with mainly muddy inshore regions. The Gulf of Mannar on the contrary, is more open and deep, strewned with rocky patches in the inshore regions (Jayaraman, 1954). The waters of Palk Bay and Gulf of Mannar mix freely through the Pamban Pass between Raman Point and Pamban Island, and through 'Adams Bridge' between Dhanushkodi and western coast of Ceylon (Jayaraman, 1954).

The area is under the influence of two monsoons; viz. the south-west and the north-east. During March to September, when south-west monsoon is active, Palk Bay remains practically calm, while Gulf of Mannar is rough. From October to the end of February the north-east monsoon prevails and Palk Bay remains rough, while Gulf of Mannar is practically calm. But for the north-east wind, there is no heavy surf in Palk Bay, mainly due to the shallow nature

of the continental shelf.

Rainfall:

The south-west monsoon contributes only very little to the total annual rainfall of this region. The area receives rain mainly during north-east monsoon. Rain is moderate to heavy during October and November, but sometimes heavy downpour may be experienced even during December and January. The mean annual rainfall for this area fluctuates between 762 and 1270 mm. (Tampi, 1959). No freshwater stream dilutes the sea around Mandapam.

Tide:

The tidal range here is low and is usually within an amplitude of a metre.

Temperature:

The monthly average atmospheric temperature of this area varies from 25° C. to 31° C. (Prasad, 1954a, 1957), with maxima and minima in May and January respectively. The daily range is from 1.5° C. in colder months to 4°C. in hotter months (Tampi, 1959).

According to Prasad (1954) the monthly averages for the surface temperature of Palk Bay for the years 1951 to 1953, varied from 24.6° C. to 29.1° C. with the lowest and highest peaks in January and April respectively. This is stated to be of a slightly lower order than that of the adjacent Gulf of Mannar where the average surface temperature varies from 25° C. to 30° C. (Jayaraman, 1954).

Humidity:

The area experiences a high percentage of relative humidity. In most of the months it is 84 and may get saturated to cent-percent in May, July and October (Tampi, 1959).

Salinity:

A regular seasonal cycle in the salinities of the surface waters of both Palk Bay and Gulf of Mannar has been reported by Prasad (1954). The salinity is low in January and then gradually rises and remain high till the middle of November; followed by a decline in December. Jayaraman (1954) has recorded the lowest salinity of 25.52 °/oo in January in Palk Bay and Prasad (1954) has recorded the highest of 36.39 °/oo in October for the same area. In Gulf of Mannar the salinity fluctuates between 27.47 °/oo and 36.45 °/oo (Prasad, 1954) in different months. But in most of the months, the salinities of Palk Bay and Gulf of Mannar range between 33 and 36 °/oo.

Plankton:

The zooplankton which forms the food of corals is more abundant in Palk Bay during the period April to December, with a maximum production in June (Prasad, 1958). In Gulf of Mannar the zooplankton production reaches its peak in March. It has been suggested (Prasad, 1958) that the total annual production of plankton in Palk Bay 'is about one and half times that of Gulf of Mannar'.

The reefs of Mandapam (Palk Bay)

Sewell (1932, 1935) has paid much attention to the recent geological changes that have taken place in this part of the peninsular India. He has suggested (Sewell, 1935) a change in the relative levels of sea and land to a maximum of 8 feet (2.5 meters) in this region. Prior to the cyclone of 1964 the present author had studied a mount of semifossilised corals on the shore, nearly 4 meters in greater width and 1.5 meters in height, completely

elevated out of the highest water-mark; about a kilometer west of the boat channel at Mandapam (Palk Bay). This raised mount was composed of mainly colonies of Goniastrea pectinata and Platygyra lamellina, the larger ones upto 50 cm. in greater diameter. Similar but smaller mounts were present on the shore in the vicinity. Evidently these coral colonies were formed under water and later elevated by a recent change in the relative levels of land and sea. Unfortunately these raised up colonies were disturbed and washed away by the devastating tidal waves lashed by the cyclone of 1964 and at present little of them is left behind.

The thriving reef at Mandapam (Palk Bay) lies almost parellel to the shore in an east-westerly direction. The lagoon is shallow, and can be waded through at lowest tides. The width of lagoon varies from 200 to 600 meters in different regions. A channel 2 to 3 meters deep, almost at the mid length of the reef, through which fishing vessels enter the lagoon, separates the reef into, the eastern and western halves. The eastern half, which extend eastward upto Pamban Pass is called Kathuvallimuni Reef, while the western half which extends westward upto Thedai is called Vellapertumuni Reef (Pl. I, fig. 2). The Kathuvallimuni Reef is comparatively wider than the Vellapertumuni Reef for most of its length. Because of their faunistic similarity and continuity, both these reefs are treated as single biotype for subsequent consideration in this work.

The details regarding the structure of the reef and its animal and plant communities presented below, are based on a study of the reef over a period of 2 years, visiting it occasionally in a flat-bottomed dinghy at low tides, during calm periods.

Some of the algae and animals other than corals mentioned herein, could not be identified to the species level. A general survey along a profile from the beach to the open bay demarcates the following areas; (1) the sandy shore, (2) the lagoon, (3) the shoreward side of the reef, (4) the reef-crest, (5) the seaward side of the reef. Each of these will be dealt with briefly below.

The sandy shore:

The shore throughout the length of the reef is purely sandy, except at the extreme eastern end near the Pamban bridge where there are indications of sand-stone formation. The vegetation on the land comprises mainly of Cocos nucifera, Borassus flabellifera, Casurina equisetifolia, Azadirachta indica along with a few thorny shrubs of Acacia sp. During the period of the south-west monsoon, when conditions at Palk Bay become favourable for fishing operations, numerous huts of fishermen spring up at the landing centre; only to be dismantled at the onset of the north-east monsoon when the fishing operations are mainly centered in the Gulf of Mannar side. The sandy beach harbours a rich infauna. During ebb tides, several holes of the burrowing crabs, Dotilla myctiroides and Scopimera proxima, the former with the pellets arranged disorderly and the latter with the pellets arranged in a radial fashion around their holes, will be seen all along the beach. The crabs often wander about near the burrows but immediately retreat into their holes when approached. The bivalve, Donax spp. common along the sandy shore are digged out in large numbers by the local people for their flesh and shell. Near the Pamban Bridge, on the sand-stones a species of Chathamalus is abundant. Oysters are not uncommon here. From June to

August, the scyphomedusa, Rhopilema hispidum are found washed ashore in large numbers. The gastropods, Umbonium vestiarium and Cerithidia fluviatalis are common, the latter representing the commonest molluscan shell of this area, found on the shore. The starfish, Pentaceraster australis (Lutkin) may often be seen, stranded by the receding tides.

The lagoon:

As already stated, the width of the lagoon ranges from 200 to 600 meters, with a depth of 1.5 to 2 meters at its central part during spring tides. Since the beach is of loose white sand, the waves, especially during the period of north-east monsoon, whip up considerable quantities of beach sand and deposit it in the lagoon, gradually filling its bottom. Further, the loose sand blown off by the south-west wind from the land, may also get deposited in the lagoon. The absence of living corals in the lagoon may probably be on account of the absence of a solid substratum, on which the planula can settle. The bottom sand is mixed with a good percentage of dead shells of Cerithidia fluviatalis .

The blue swimming crab, Neptunus pelagicus is occasionally seen at the water-mark. The larger dead shells of Cerithidia fluviatalis and Murex trapa are found inhabited by the hermit crabs. In the deeper parts of the lagoon variously coloured, branching sponges are fairly common. Hercinia fusca Carter, Dysidea fragilis (Montagu), Spirastrella inconstans Dendy, Haliclona tenuiramosa (Burton), Callyspongia diffusa (Ridley) and C. fibrosa (Ridley and Dendy) etc. are some of the common sponges that can be easily collected from this area. The sea-anemone'

Stoichactes sp. is not uncommon. The small tube-dwelling polychaete, Spriorbis sp. is found in abundance on the sea grass Cymodocea. The millipore, Amphiroa sp., affords protection to several small Amphipods here. At least three species of echinoderms viz. Pentacerastor australis (Lutkin), Holothuria atra (Jager) and H. scabra (Jager), are commonly met with in the lagoon. Numerous small fishes may be found moving hither and thither, both at the bottom and at the surface of the lagoon. The larvae of Hemirhamphus sp. and Caranx sp. were collected during July and August.

The floor of the lagoon supports a rich vegetation. Cymodocea covers extensive areas except a thin strip along the shore. The alga Ulva reticulata was found covering abundantly extensive areas, during June to September. Amphiroa and the calcareous green alga Halimeda are very common. Among the other major algae Turbinaria sp. and Padina spp. are also common.

The shoreward side of the reef:

The reef gradually rises from the lagoon floor. The shoreward side of the reef is composed of large reef-rocks 50 to 100 cm. in greater diameters. They are widely spaced with their interspaces filled with loose sand similar to that of the shore. In the sandy interspaces Cymodocea and a few algae are found growing. Majority of the corals occuring in this part of the reef are either encrusting or massive. Individual colonies are small, generally ranging from 10 to 20 cm. in greater diameters. Colonies are rather wide apart. Though the fauna is rich in regard to the number of species, none of the species can be said to be abundant; but Favia pallida and Leptastrea transversa outnumber the others.

Other massive corals like Goniopora stokesi, Porites spp., Favia favus, Favites virens, Goniastrea retiformis, Platygyra lamellina, Hydnophora exesa, Symphyllia recta and Cyphastrea microphthalma occur in good numbers. The polyps of the majority of the above mentioned species, are found partly or fully expanded during day time; but none is so spectacular as Goniopora stokesi, the polyps of which may rise 4 or 5 cm. above the skeleton when fully expanded completely concealing the latter. Galaxea fascicularis is occasionally seen in crevices of reef-rocks. The family Agariciidae is poorly represented, since only one colony of Pavona varians was noticed during the investigation from this reef. Turbinaria peltata was once collected from the west of the fish landing centre. Ramose corals are rare here, though Acropora corymbosa and Montipora divaricata may be occasionally found.

This part of the reef supports a rich fauna of reef-dwellers. Encrusting sponges and bryozoans are abundant on corals. At least 4 genera of Alcyonaria have been noticed here, the commonest being Lobophytum sp. and Sarcophytum sp. Polychaetes are numerous on corals, the parasitisation by some of them causing the formation of irregular, nodular branches in certain colonies of Leptastrea transversa, Cyphastrea microphthalma and Montipora. A small tube-dwelling sabellid, Potamella sp. with its tentacular crown beautifully expanded, was collected on several occasions from Favia pallida. Gastropods, like Cerithidia fluviatalis, Murex sp. and Drupa sp. along with numerous bivalves were found crawling over coral colonies. Lambis truncata is common among the rocks in this part. A living specimen once collected was found to have a small colony of Favites virens at its top with

another of Siderastrea savignyana. The gastropod, as well as the corals thrived in the aquarium for a few months until all were killed owing to the failure of water circulation after the 1964 cyclone. The boring bivalve, Lithophaga is represented here at least by 2 species, both quite common at the under sides of dead and living colonies of Favia pallida. The brittle-star, Ophiactis savignyi (Muller and Troschel) was recorded several times from this part. Both, Holothuria atra and H. scabra are found in the sandy interspaces of the rocks.

The reef-crest:

This represents the region between the shoreward and seaward sides of the reef which is exposed at low tides. As Stephenson et al (1931), have described for the Yonge Reef, 'its general level is slightly higher than that of the surrounding regions, and it constitutes as it were, the back bone of the reef'. It is, however, not a continuous structure at Mandapam and a boulder zone is wanting, unlike the Krusadai Island where such a structure is demarcated (Sewell, 1935). This part of the reef is comparatively devoid of corals, probably owing to the vivising influence of intermittent exposure to sun. But rarely in crevices and under sides of rocks, small, encrusting colonies of Goniopora duofaciata and Leptastrea transversa may be seen. Clavularia sp. with all its eight pinnate tentacles beautifully expanded was observed at the sides of rocks. The sea grass, which flourishes in the lagoon is rare here. Among the non-calcareous algae, Padina sp. and Caulerpa peltata are the commonest.

The seaward side of the reef:

This part of the reef is composed of permanently submerged boulders with a luxurient growth of branching corals. Many of the encrusting and massive species occurring in the shoreward side may also be found in this part, but not in such greater profusion as they are on the shoreward side. Among the branching forms, Pocillopora damicornis and Acropora corymbosa are the commonest. The former is seen, only opposite the fish landing centre, whereas the latter is found thruughout the length of the reef. Larger colonies of A. corymbosa may attain a greater diameter of 60 to 80 cm. here. A.haimei and A. formosa are found in good numbers, while A. squamosa is restricted to the middle length of the Vellapertumuni Reef where it occurs in fair numbers. The greenish colour of the living corallum of the last mentioned species, with its pink axial corallites makes it quite attractive in undisturbed waters, especially on sunny days. A. intermedia is seen only near the Pamban Pass where the species was once abundant, as evidenced by the presence of large number of dead and broken pieces. A few species such as A. thurstoni, A. obscura, A. pharaonis and A. polymorpha are rarely met with. Colonies of Montipora divaricata with large arborescent coralla are present in fair numbers. M. foliosa though present, is not so abundant as it is in the Gulf of Mannar.

A large number of animals, chiefly crustaceans are found constantly associated with the corals of this part of the reef. At least two species of brilliantly coloured Alpheus were found among the branches of Pocillopora damicornis and Acropora corymbosa. Trapezia sp. can be collected from almost all colonies of

P. damicornis. The spider crab, Tylocarcinus styx (Herbst) was recorded in plenty on P. damicornis and A. corymbosa in June and July 1964. But, curiously enough, when the author examined these corals from the same spot, in August 1965, the crabs showed a marked reduction in their numbers. A small cirrepede probably Pyrogoma sp. was noted frequently at the tip of the branches of Acropora corymbosa. The coral seemed to react to the presence of the cirrepede by trying to entomb the latter, by the coenenchymal overgrowth. The tip of such infested branches were irregularly swollen and was provided with small labellate radials, their axial corallites being secondarily lost by coenenchymal overgrowth. Several large errant polychaetes were found associated with Acropora spp. At least three species of coral reef, fishes, viz. Chaetodon octofasciatus, Pseudochromis fuscens and Holocentrus diadema were found among the fronds of Montipora foliosa. These highly coloured small fishes simulate 'hide and seek' by regularly coming out of their hiding places and roaming about for a moment and then retreating immediately into the corals. A baby Octopus was once found on a dead colony of Favia pallida brought up from a depth of nearly three meters.

The vegetation in this part of the reef shows no marked difference from that of the shoreward side, except that the sea-grass becomes sparse.

With a view to studying the horizontal distribution of corals on this reef, a detailed sampling survey of a traverse, across the reef was attempted. The survey was conducted in Vellapertumuni reef, about one thousand meters west of the western extremity of the Kathuvallimuni reef. The position of the

traverse is indicated by the arrow in Pl. I, fig. 2. This particular spot was selected for the survey for the following reasons.

(1) The lagoon in this area is moderately wide.

(2) T he reef is of average width.

(3) A preliminary survey revealed a better representation of the coral fauna, known thoughout the reef, when compared to other parts. Further the a rea is found to be least deplected by removal of limestones.

The method adopted for the collec tion of data was as follows. A thick rope, 150 meters in total length with every 5 meters of it, marked by a strip of cloth was stretched across, by means of two anchors; after establishing an initial line from shore to the open bay. The traverse was started from the lowest water mark at the time of initiation of the work, at spring tide, in the middle of August 1965. A squaremeter metalframe was placed along the rope at marked intervals of 5 meter, in such a way that the centre of the frame almost coincided with the marking on the rope. Hence, the area one squaremeter examined (within the frame) at any station, included 50 cm. on either side of the actual marking; but for reasons of convenience, the distance given for any station in the Table IX is the actual distance of the marking on the rope from the zero point. As the water was shallow, clear and undisturbed, the algae, corals and other animals if any, that were present within the metal frame, could be easily studied with the help of a diving mask and snorkel. A flat-bottomed dinghy could easily be operated throughout the traverse in which a field note book and other necessary articles

for recording data were kept. The presence, dominance or absence of corals between the stations were also noted. A half-meter scale was used for measuring the coral colonies. Since the author had made a detailed systematic study of the corals of this reef prior to undertaking the survey, he experienced very little difficulty in identifying majority of the corals in the field itself. Nevertheless, doubtful specimens were brought to the laboratory with necessary station marks, for subsequent identification. Depth was noted with a sounding line. The details of the survey are presented in Table IX. Table X shows the total number of colonies of each species represented at the various parts of the reef, alongwith an analysis of the growthform and the size of the polyps of the various species.

Details of the analysis of the traverse

The shore:

This has already been described. No station above the water mark was studied with reference to its infauna.

Lagoon - 0 to 230 meters:

The appearance of the reef-rocks in the traverse is taken as the outward limit of the lagoon. The maximum depth at any part of the lagoon in the traverse measured was 1.75 meters. The first twenty meters (5 stations) was practically devoid of any vegetation, the bottom being sandy with dead and living shells of *Cerithidia fluviatalis*. Beyond 20 meters the sea-grass began to appear and dominate to a distance of 150 meters, with occasional nullipores and *Ulva reticulata*. *Spirorbis* sp. was found in abundance on the sea-grass. Between

150 meters and 230 meters the bottom sand, just below the surface, became finer and blacker assuming a muddy nature. Eventhough Cymodocea became rare nulliporas were common. No coral was noticed in any of the station studied in the lagoon.

Shoreward side of the reef - 230 to 330 meters

The depth ranged from 0.75 to 1.0 meter in different stations, depending on the nature of the bottom. The first corals to appear in the traverse were two colonies of Porites somaliensis, (20 and 25 cm. respectively in greater diameters) with a small colony of Favia pallida, at a distance of 230 meters, from the zero point. From 230 to 245 meters the bottom was rocky and sandy and showed no coral. At 245 meters, two small colonies - about 10 cm. each in greater diameter - of Leptastrea transversa appeared. Between 245 and 260 meters Favia pallida and L. transversa were present. The next 10 meters in the line showed no coral. At 260 meters one colony of F. pallida and another of Cyphastrea microphthalma have been noticed. Between 260 and 270 meters no coral could be observed. Again, F. pallida and L. transversa dominated between 270 and 280 meters. A small colony of Acropora corymbosa, about 15 cm. in diameter, two of Porites lichen one of L. transversa and another of Favites virens were recorded at 285 meters away from the shore. In the next 10 meters, Favia valenciennesii, F. pallida, Goniastrea halicora, L. transversa and Cyphastrea microphthalma were found to occur intermittently. Small patches of L. transversa were noticed in plenty between 320 and 330 meters. The next 10 meters showed no coral.

Reef crest - 330 to 360 meters:

The homology of the part of the reef named so in this work with well developed coral reefs of other regions is rather doubtful. The depth varied from 20 to 25 cm. in different stations when measured from the top of the rocks. In sandy areas sometimes the depth exceeded 0.75 meters. No coral was seen in any of the stations.

The seaward part of the reef - 360 to 450 meters:

The regular sampling could be done only upto 425 meters, beyond which the depth increased to 3 meters or more. From 375 meters onwards, Acropora spp. began to dominate in the line followed by a decline in the number of encrusting and massive forms. At 375 meters there appeared two small colonies of A. corymbosa. A colony of Pocillopora damicornis was noted at 380 meters. Between 380 and 400 meters P. damicornis and Montipora digitata were noted. A. haimei, A. corymbosa and M. divaricata were present between 400 and 420 meters. The single colony of M. foliosa noticed all along the line was found at 420 meters. Between 420 and 450 meters there was a preponderance of Acropora spp., mainly of A. corymbosa, beyond which the bottom is muddy and devoid of any coral.

As enlisted in Table X, fifteen species of scleractinia, assignable to nine genera, were found in the line, distributed in 40 stations; out of the 59 species belonging to 20 genera known to occur on this reef (Table I).

The above sampling analysis of the traverse, as well as the general picture of the reef with its fauna presented earlier, clearly indicates a marked difference in the coral faunas of the

shoreward and the seaward sides of this reef. The paucity of the branching and the dominance of the massive and encrusting types of corals in the shoreward side are noteworthy. Similarly the encrusting and massive forms of corals lose their significance at the seaward side, where branching forms are in abundance. Manton (1935) has also noted a similar case at Low Isles. Yonge (1940) has stated that "in general, the more solidly built corals occur on the exposed seaward slopes of reefs while branching and foliaceous forms in sheltered water". However, it is interesting to note that in Palk Bay the delicately branching Acropora spp., Montipora spp. crowd at the outer side of the reef while the inner protected side harbours more solidly built massive and encrusting species. As has already been stated, Palk Bay is generally calm for nearly six months in a year and even when it is rough the mechanical force of the waves on the reef may not be of a high degree to have marked effect on corals. Since the water here is less agitated, there may possibly have a severe struggle between various forms of corals for their existence; the more successful ones crowding out the less successful (Mayer, 1918). But judging from the widely spaced nature of the coral colonies, it appears that this interspecific competition is of little significance in controlling the horizontal distribution of corals on the reef of Palk Bay. Further, the distantly placed coral colonies as a reef is suggestive of a severe struggle against an adverse environmental condition (Mayer, 1918). One of the factors that influence the horizontal zoning of corals on a reef is temperature (Mayer, 1918; Yonge, 1968). Surface temperature recorded at noon, on the reef in Palk Bay, at random dates, (Table XI) was found to be uniform throughout the width of the reef;

TABLE IX

Details of the analysis of the traverse.

Distance in mtrs.	Depth in mtrs.*	Nature of the bottom	Name of corals present.	No. of colonies of each species
0 to 20	0 to 0.75	Sandy. No vegetation.	nil	-
20 to 150	0.75 to 1.5	Sandy. Covered by Cymodocea	nil	-
150 to 230	1.5 to 1.75	Surface sand loose and white, below black. Nullipore with occasional Cymodocea	nil	-
230	1.5	A large rock surrounded by sand.	Porites somaliensis Favia pallida	2 1
235	1.5	Small rubbles with sandy interspaces.	nil	-
240	1.25	Rocky	nil	-
245	1.5	Small rubbles with sandy interspaces.	Leptastrea transversa	2
250	1.5	-do-	Favia pallida Leptastrea transversa	1 2
255	1.5	-do-	nil	-
260	1.5	-do-	Favia pallida Cyphastrea microphthalma	1 1
265	1.25	Rocky	nil	-
270	1.5	Sandy	nil	-
275	1.0	Rocky	Leptastrea transversa Favia pallida Favites virens	4 1 1
280	0.75	Rocky and sandy	Leptastrea transversa L. purpurea Favia pallida	5 1 4
285	0.75	Large rock	Porites lichen Leptastrea transversa Favites virens Acropora corymbosa	2 1 1 1

TABLE X

List of corals found in 40 stations studied on the reef with an analysis of their growthform and nature of polyps.

S. No.	Name of the species	Growthform	Nature of the polyp.	No. of colonies in 20 stations in shoreward side.	No. of colonies in 7 stations in reef-crest.	No. of colonies in 13 stations in seaward side.	Total No. of colonies in 40 stations throughout the reef.
1.	Pocillopora damicornis	R	S	-	-	3	3
2.	Acropora corymbosa	R	S	1	-	4	5
3.	A. haimei	R	S	-	-	1	1
4.	Montipora digitata	R	S	-	-	1	1
5.	M. divaricata	R	S	-	-	1	1
6.	M. foliosa	F	S	-	-	1	1
7.	Porites somaliensis	M	S	2	-	-	2
8.	P. lichen	E	S	2	-	-	2
9.	Favia pallida	M	L	8	-	-	8
10.	F. valenciennessii	EM	L	1	-	-	1
11.	Favites virens	EM	L	2	-	1	3
12.	Goniastrea pectinata	EM	L	1	-	-	1
13.	Leptastrea purpurea	EM	L	1	-	-	1

Table IX (contd.)

Distance in mtrs.	Depth in mtrs.*	Nature of the bottom	Name of corals present.	No. of colonies of each species
290	0.5	Large rock	Cyphastrea microphthalma Favia valenciennessii	1 1
295	0.75	Rocky and sandy	Goniastrea pectinata	1
300	1.0	-do-	nil	-
305	1.0	-do-	Cyphastrea microphthalma	1
310	1.0	-do-	Leptastrea transversa	7
315	1.0	-do-	L. transversa	4
320	1.0	-do-	L. transversa	8
325	1.0	-do-	nil	-
330 to 360 (7 stations)	0.5 to 0.75	-do-	nil	-
365	1.0	Rocky	Favites virens	1
370	1.0	-do-	nil	-
375	1.25	Rocky and sandy	Acropora corymbosa	2
380	1.25	-do-	Pocillopora damicornis	2
385	1.25	-do-	nil	-
390	1.5	-do-	Montipora digitata	1
395	1.25	-do-	nil	-
400	1.5	Rocky	Pocillopora damicornis	1
405	1.5	Rocky and sandy	Montipora divaricata	1
410	1.5	Rocky	Acropora haimei	1
415	1.75	-do-	nil	-
420	2.25	-do-	Montipora foliosa	1
425	2.5	Rocky and sandy	Acropora corymbosa	2

*Depth is given as it is measured during the survey.

Table X (contd.)

S. No.	Name of the species	Growthform	Nature of the polyp.	No.of colonies in 20 stations in shoreward side.	No.of colonies in 7 stations in reef-crest.	No.of colonies in 13 stations in seaward side	Total No.of colonies in 40 stations throughout the reef.
14.	Leptastrea transversa	EM	L	32	-	-	32
15.	Cyphastrea microphthalma	EM	L	4	-	-	4
	Total No. of encrusting and massive colonies	-	-	53	-	1	54
	Total No. of ramose colonies	-	-	1	-	10	11
	Total No. of foliaceous colonies	-	-	-	-	1	1
	GRAND TOTAL	-	-	54	-	12	66

R = ramose
F - foliaceous
EM - encrusting and massive
M - massive
L - large
S - small

which suggests that the horizontal zoning of the corals on this reef is controlled by factors other than temperature.

TABLE XI

Temperature recorded at noon at random dates in Palk Bay.

Date	Nature of tide	Atmospheric temperature	Surface temperature	Remarks
8.7.1966	Tide coming in.	34° C.	31° C.	Sunny day
20.7.1966	Tide coming in.	31° C.	29° C.	Cloudy day
14.8.1966	Tide receding.	34° C.	31.5°C.	Sunny day
25.9.1966	Tide begin to recede.	30.5° C.	31° C.	First rain in the season on the previous night.
16.10.1966	Tide coming in.	30° C.	31° C.	Sky overcast in the morning

It may be noted that the majority of the genera and species of scleractinia present at the shoreward side of the reef in Palk Bay possess comparatively larger polyps; while small-polyped forms are found to colonise on the seaward side. The small-polyped Porites spp. though present on the shoreward side, however, is not a dominant element among the fauna.

The shore at Mandapam being purely sandy, even slight disturbances will cause stirring up of considerable quantity of fine sand and it get suspended in the waters of the lagoon. It is reasonable to assume that the adverse effect of sedimentation, will be more during the north-east monsoon, when turbulant conditions prevail in the Bay. It is quite possible that the

deleterious effect of settling sand and silt will be comparatively more at the shoreward side, than at the seaward side of the reef. But no experimental proof to the above view is available at present from this area. A high degree of sedimentation is harmful to small-polyped species of corals and they are forced to retreat to the outer side of the reef where conditions for existence may be more favourable. Marshall and Orr (1931) have shown that, large-polyped corals can remove settling sand and silt more effectively than small-polyped forms. Porites though essentially a small-polyped form is very effective against the deleterious effect of sedimentation (Mayor, 1924a). Even the small-polyped ramose forms that are present here are all characterised by slender stems. This slender stemmed corals can combact the adverse effect of sedimentation more effectively than those with stouter stems (Marshall and Orr, 1931). The large-polyped forms with their ability to fight against the deleterious effect of sedimentation, however, manage to thrive on the shoreward side of the reef in Palk Bay though not very successfully.

A comparison of the coral faunas of Palk Bay with that of the various nearby Islands in the Gulf of Mannar near Mandapam yields certain interesting deductions. The abundance of certain species of corals in the Gulf of Mannar and their paucity in Palk Bay is worth noting. To cite a few examples, Acropora surculosa forms large platforms at Manauli Island and Hare Island, but the species is not at all seen in Palk Bay. Same is the case with the thicker and tufted stemmed species of Acropora such as A. nobilis, A. humilis and A. erythraea, all of which are fairly

common in the Gulf of Mannar but rare or absent in Palk Bay. While Montipora digitata, M. divaricata and M. foliosa flourish at Krusadai Island, Pulli Island, Manauli Island and Hare Island, they are comparatively rare in Palk Bay. Another interesting contrast is that of Porites spp. Larger colonies of this genus reaching about a meter or so in diameter are quiet common in the Gulf of Mannar, but at present the genus does not seem to have a luxuriant growth in Palk Bay. The members of Faviidae are represented on both sides, but the larger colonies of Favites abdiata, Goniastrea retiformis and Platygyra lamellina of Gulf of Mannar are a marked contrast to the smaller colonies of the same species in Palk Bay. It can generally be stated that the various fringing reefs in the Gulf of Mannar near Mandapam are at present, more luxuriant in their coral fauna than those of Palk Bay, both in the number (Table I) and in the abundance of species.

This disparity in the size and abundance of coral colonies in these two areas can be due to, either or both of the following reasons. (1) The coral reef in Palk Bay is embryonic so that colonies have not yet attained their maximum size. (2) The existing environmental conditions in Palk Bay are very deleterious to coral growth. Now let us examine the applicability of each of the above points.

The presence of elevated mounts of large coral colonies (p. 286) clearly indicate an old coral growth in Palk Bay side of Mandapam and the first suggestion is of little significance in the present context. The second point appears to carry more truth in it. The available data, on surface temperature,

salinity and plankton production of these two areas show that they are not markedly different so as to have any differential effect on the coral growth of these two areas. Another factor that needs consideration is the degree of sedimentation.

Any visitor to the reef at Mandapam after the turbulent conditions of the north-east monsoon will immediately notice the large number of freshly killed colonies of the commonest species viz. Favia pallida and Leptastrea transversa. The present author himself has noticed this phenomenon for three consecutive years. Those colonies that escape the onslaughts of one season, are left only to plead to the mercy of nature during the next year. On calm periods, they undergo a period of very active growth as may be inferred from the presence of several small, newly formed buds in majority of the colonies. It may be this recurrent mortality of the corals that prevents their luxuriant growth in Palk Bay at present.

The effect of 1964 cyclone on the coral growth around Mandapam.

Stephenson, Endean and Bennet (1958) and Stoddart (1962) have summarised the catastrophic effect of storms, on the coral growth of Low Isles and British Honduras respectively and have concluded that, massive and slower growing scleractinians are more successful against the devastating effects of cyclone, than the fast growing slender forms.

A cyclone that claimed many human lives, hit this region on 22nd and 23rd December 1964. The wind was of a velocity of above 75 kilometers per hour (Nair, et. al., 1965). It was experienced at Mandapam throughout the night of 22nd in a

north-easterly direction and was blowing with great fury till 23rd morning. It then stopped at about 9 A.M., abruptly for an hour, only to blow once again in a south-westerly direction for another six hours. Tidal waves, nearly 25 feet (7.6 meters) high were caused (Nair, et. al. op. cit.) that swept across Dhanushkodi causing unprecedented havoc to Ceylon, Rameswaram Island and neighbouring places.

The effect of this cyclone on the corals around Mandapam, could be studied only after two months in the Gulf of Mannar side and after six months in Palk Bay side since the seas continued to be rough. Since the present author was quiet familiar with these reefs prior to the cyclone, his subsequent visits to them, enabled him to assess in general the damages done to the corals as a result of the cyclone. In general the corals of Palk Bay were found to be more affected by the tidal waves caused by the cyclonic winds than those of the Gulf of Mannar. The branching corals, especially Acropora spp. were the worst hit by the cyclonic rampage. Several colonies of A. corymbosa were found to be broken at their base and washed to the shoreward side of the reef and the lagoon in Palk Bay. The larger colonies of A. surculosa sustained similar damage at Manauli Island and several of them were noticed to be turned upside down. These upturned colonies began to put forth upwardly directed prominent branchlets at their original lower side. The massive forms like Favia, Favites, Platygyra, Symphyllia etc. were, however, not much affected in the Gulf of Mannar side. But there was an overall reduction in the living colonies of these massive forms in Palk Bay

mainly due to the killing of them by the large quantity of sand deposited by the waves. The large platforms of Montipora foliosa and Echinopora lamellosa at Krusadai Island and Manauli Island were apparently little damaged.

The alcyonarians also suffered severe lose. The dense formation of Lobophytum and Sarcophytum thrived at the eastern end of Kathuvallimuni reef prior to the cyclone was apparently destroyed during the cyclone and in June 1965 few of them were found to be in living condition. In short the immediate effect of the cyclone on the reefs around Mandapam was a general destruction of their coral fauna.

II. COMPOSITION OF THE EXTANT SHALLOW-WATER SCLERACTINIA OF MANDAPAM

The various localities in Palk Bay and Gulf of Mannar around Mandapam investigated for their coral fauna, are considered here a single coral faunal district. The area lies between two major coral formations in the Indian Ocean, namely the Maldives in the west and the Malaysia in the east. A thorough and intensive collection of corals of this area is attempted during the present investigation; in the light of which the composition of the shallow-water corals of this area and their relation to the coral faunas of other Indo-Pacific areas are summarised. A review of the scleractinian genera so far known from this area is presented below. The number shown against each genus indicates the total number of species hitherto recorded from here. Complete list of species of each genus is given in Table XII.

1. Psammocora (1)

The genus is known to this area only from Krusadai Island where occasional colonies are seen in the lagoon, mixed with Pocillopora damicornis and Montipora digitata.

2. Pocillopora (2)

P. damicornis flourishes in the lagoon of the various islands in the Gulf of Mannar and at the seaward side of the reef in Palk Bay. P. danae is rare.

3. Acropora (26)

A. corymbosa in Palk Bay and A. surculosa in Gulf of Mannar are the commonest members of the genus. A. nobilis also

enjoys a luxuriant growth in Hare Island. A few species appear to be endemic.

4. Montipora (19)

M. digitata, M. divaricata and M. foliosa are the commonest members here. They are mainly lagoon species.

5. Pavona (3)

Not a common reef-builder in this region. The foliaceous number, P. decussata is fairly common at the northern side of Manauli Island on the tops of the dead platforms of Echinopora lamellosa. Other two species rare.

Pavona (Polyastra) (1). This subgenus is known to this area by a single colony collected by the present author from the western side of Krusadai Island.

6. Pachyseris (1)

This genus is very rare here.

7. Siderastrea (2)

Met with in rocky, sandy and even muddy bottoms. In the eastern side of Pulli Island, colonies of S. radians were noticed to be completely exposed at low tides, though bathed by occasional waves.

8. Coscinaraea (1)

Not commonly met with.

9. Goniopora (4)

This genus is fairly common in all localities though not abundant. G. nigra new name, and G. duofaciata are the commonest

members. G. stokesi is present in fairly good numbers in Palk Bay.

10. Porites (9)

This genus is seen in all localities though the living colonies at present are gradually dwindling in numbers. It is comparatively more luxuriant in the Gulf of Mannar than in Palk Bay. P. solida, P. somaliensis and P. mannarensis new name are the commonest.

11. Favia (5)

The members of this genus are present in all localities around Mandapam. Favia pallida surpasses all others in the number of colonies. Favia favus is also common in Palk Bay.

12. Plesiastrea (1)

The only record of this genus from this area is that of Gravely (1927) from Pamban.

13. Favites (6)

F. abdiata forms large massive colonies in the lagoon of Krusadai Island and Manauli Island. F. virens is fairly common on the inner side of the reef in Palk Bay. Other members rare.

14. Goniastrea (3)

G. retiformis is the commonest member. G. incrustans is the rarest among the three.

15. Platygyra (1)

This is a very common genus in this area.

16. Leptoria (1)

Rare. No living colony could be traced.

17. Hydnophora (3)

H. exesa is fairly common in Palk Bay, others rare.

18. Leptastrea (2)

One of the commonest genera of corals present here. L. transversa is very abundant. L. purpurea rare.

19. Cyphastrea (3)

C. microphthalma is very common in Palk Bay and is the richest member of the genus here. C. serailia and C. chalcidicum are occasionally met with.

20. Echinopora (2)

E. lamellosa forms large platforms in the lagoons of Krusadai, Manauli and Hare Island. E. gemmacea could be collected only once.

21. Culicia (1)

The genus will be found on rocks and dead Porites at Manauli and adjacent islands. It was often noticed partly covered by encrusting bryozoans in living condition. The small size of its calices makes the genus inconspicuous on the reef.

22. Galaxea (2)

Not very common. It prefers crevices of reef-rocks. G. fascicularis occurs in almost all localities in this region, but not abundant.

23. Merulina (1)

Not a common genus here. Living colonies are seen only in Manauli and Hare Island in very shallow waters.

24. Symphyllia (2)

S. recta is fairly common in all localities. S. radians rare.

25. Mycedium (1)

This genus was not found in live condition in any of the reefs investigated.

26. Trochocyathus (1)

This solitary coral is fairly common on the under sides of other coral colonies in the Gulf of Mannar.

27. Paracyathus (1)

P. parvulus is very common on rocks and dead colonies of Porites in Gulf of Mannar.

28. Endopsammia (1)

This solitary coral is known to this area by seven specimens collected by the present author from a colony of Acropora surculosa from Manauli Island.

29. Dendrophyllia (2)

Not commonly met with.

30. Turbinaria (4)

The genus is not a dominant element among the hermatypic corals of this region. None of its members is commonly met with.

As enlisted in Table XII the coral fauna around Mandapam consists of 112 species assignable to 30 genera and one subgenus. It may be represented thus:

	Hermatypic	Ahermatypic	Total
Genera	25	5	30
Subgenus	1	nil	1
Species	106	6	112

All these genera and species can be collected from shallow waters (except Mycedium and Plesiastrea which are not seen) where the depth usually does not exceed 1 to 1.5 meters at low tides. Further investigations in the deeper waters may yield a few more genera and species, hitherto not recorded from here. The total of 106 species of hermatypic corals from the shallow waters alone, may be regarded as a good representation of the group and the number is in general agreement with the faunastic records of other Indo-Pacific areas. A few such areas alongwith the number of known species of corals are given below for comparison.

S.No.	Area	No. of species	Author and year
1.	Red Sea	75	Vaughan and Wells (1943).
2.	Singapore (Raffles Light)	73	Purchon (1956).
3.	Cocos-Keeling Islands	74	Wells (1950).
4.	Amboina	88	Umbgrove (1939).
5.	Bay of Batavia	117	Umbgrove (1939).
6.	Palau Islands	141	Eguchi (1938)
7.	Low Isles (specifically)	110	Stephenson and Wells (1956).
8.	Marshall Islands (surface reefs alone)	150	Wells (1954).
9.	Samoa	85	Hoffmeister (1925).
10.	Tahiti	43	Vaughan and Wells (1943).

Out of the 80 genera and 700 species of hermatypic scleractinians known to occur throughout the Indo-Pacific (Wells, 1957); only 25 genera and one subgenus totalling to 106 species are known from this area. None of the genera is endemic; though a few species of Acropora appear to be so. The genera such as Zoopilus, Bikiniastrea, Simplastrea, Palauphyllia, Physophyllia, Physogyra and Plerogyra are rare and endemic to certain regions and are not represented around Mandapam. Several widespread genera like Coeloseris, Caulastrea, Diploastrea, Lobophyllia and Euphyllia are also found missing on the reefs around Mandapam. While Pocillopora is abundant (although represented by only two species here) its closely related genera Stylophora and Seriatopora are absent. The taxonomically difficult genera Acropora and Montipora together constitute 40% of the total number of species known around Mandapam. Members of the Agariciidae are not dominant; the two genera - Pavona and Pachyseris - present, being rare. A very interesting element among the fauna, is the genus Siderastrea - "a relic genus of the old Tethyan Tertiary coral fauna of the Indo-Pacific, although it is still widespread in the tropical Atlantic" (Wells, 1954). Mention should also be made of the total absence of Fungiidae though Thurston is reported to have once dredged a young specimen of Fungia from the muddy bottom of Pamban channel (Bull. Madras Govt. Mus. 1927. New ser. 1, p. 5). The members of the family Poritidae and Faviidae are rich and form very conspicuous elements among the fauna.

A check list of the coral fauna around Mandapam, alongwith the distribution of the various species in seven other Indo-Pacific areas is presented in Table XII. These geographic regions were selected in compiling the table, not only because our knowledge of their coral fauna is comprehensive, but because they represent widely separated faunal districts throughout the great Indo-Pacific. As shown in the Table (Table XII) 45 species of corals are common to Mandapam and Red Sea, whereas 32 species are common around Mandapam and Singapore. The Cosos-Keeling Islands is found to have among its fauna 32 species that are also known around Mandapam. This area and Palau Islands share 43 species in common. 59 species are common to Low Isles and this place; while the Marshall Islands is found to harbour 55 species that are also recorded around Mandapam. Among the coral fauna of Samoa and this area, at least 36 species are common. Six species are common to all the 8 regions considered, and very many are missing only in one or two regions, being represented in all others. A marked similarity in the composition of the coral fauna throughout the Indo-Pacific have been suggested by Vaughan and Wells (1943). While the coral fauna of this region has much in common with that of the Red Sea, it is also rich in the Australian, Marshall Islands and Samoan elements. In conclusion it may be stated that the coral fauna around Mandapam is in general agreement with any other Indo-Pacific area, both in number of species and its composition, species that are endemic being only a few.

TABLE XII

Check list of the coral fauna around Mandapam with the distribution of the various species in seven other Indo-Pacific areas. Genera and species are listed in the order of their preference in the systematic part of this work.

S. No.	Name of the species	Red Sea	Singapore	Cocos-Keeling Islands	Palau Islands	Low Isles	Marshall Islands	Samoa
	Genus Psammocora							
1.	P. contigua (Esper)	x	x	-	x	x	-	x
	Genus Pocillopora							
2.	P. damicornis (Linnaeus)	x	x	x	x	x	x	x
3.	P. danae Verrill	-	-	-	-	x	x	-
	Genus Acropora							
4.	A. cervicornis (Lamarck)	x	-	-	-	-	-	-
5.	A. intermedia (Brook)	-	-	-	-	x	-	-
6.	A. formosa (Dana)	-	x	x	x	x	x	x
7.	A. haimei (Milne Edwards and Haime)	x	x	-	-	x	-	-
8.	A. nobilis (Dana)	-	x	-	-	-	-	x
9.	A. pharaonis (Milne Edwards and Haime)	x	-	x	x	-	-	-
10.	A. multicaulis (Brook)	x	-	-	-	-	-	-
11.	A. multiformis (Ortmann)	-	-	-	-	-	-	-
12.	A. thurstoni (Brook)	-	-	-	-	-	-	-
13.	A. obscura (Brook)	-	-	-	-	-	-	-
14.	A. sp.							
15.	A. corymbosa (Lamarck)	x	x	x	-	x	x	x
16.	A. hyacinthus (Dana)	-	x	-	x	x	x	x

Table XII (contd.)

S.No.	Name of the species	Red Sea	Singapore	Cocos-Keeling Islands	Palau Islands	Low Isles	Marshall Islands	Samoa
17.	A. surculosa (Dana)	-	x	-	-	x	x	-
18.	A. spicifera (Dana)	-	x	x	-	-	x	-
19.	A. indica (Brook)	-	-	-	-	-	-	-
20.	A. squamosa (Brook)	-	-	-	-	x	-	-
21.	A. sp. cf. exigua (Dana)	-	-	-	x	-	-	x
22.	A. humilis (Dana)	x	x	x	x	x	x	x
23.	A. diversa (Brook)	-	-	-	-	x	x	-
24.	A. digitifera (Dana)	-	-	-	-	x	x	-
25.	A. erythraea (Klunzinger)	x	-	-	-	-	-	-
26.	A. ceylonica (Ortmann)	-	-	-	-	-	-	-
27.	A. polymorpha (Brook)	-	-	-	-	x	x	-
28.	A. ? microphthalma (Verrill)	-	-	-	-	x	x	-
29.	A. echinata (Dana)	-	-	-	x	x	x	x
	Genus Montipora							
30.	M. subtilis Bernard	-	-	-	-	-	x	-
31.	M. gramulosa Bernard	-	-	-	-	-	x	-
32.	M. explanata Bruggemann	-	-	-	-	-	-	-
33.	M. exserta Quelch	-	-	-	-	-	-	-
3 4.	M. digitata (Dana)	-	x	x	-	x	-	-
35.	M. divaricata Bruggemann	-	x	x	x	x	-	-
36.	M. turgescens Bernard	-	-	-	-	x	x	-
37.	M. manauliensis sp. nov.	-	-	-	-	-	-	-
38.	M. elscheneri Vaughan	-	-	-	-	-	x	x
39.	M. monasteriata (Forskal)	x	-	-	-	-	-	-

Table XII (contd.)

S.No.	Name of the species	Red Sea	Singapore	Cocos-Keeling Islands	Palau Islands	Low Isles	Marshall Islands	Samoa
40.	M. venosa (Ehrenberg)	x	-	-	-	x	x	-
41.	M. spumosa (Lamarck)	-	-	x	-	x	-	-
42.	M. edwardsi Bernard	x	-	-	-	-	-	-
43.	M. spongiosa (Ehrenberg)	x	-	-	-	-	-	-
44.	M. verrucosa (Lamarck)	?x	-	-	x	x	x	x
45.	M. verrilli Vaughan	-	-	-	-	-	x	x
46.	M. informis Bernard	-	x	x	-	x	x	-
47.	M. composita Crossland	-	-	-	-	x	x	-
48.	M. foliosa (Pallas)	-	-	x	x	x	-	-
	Genus Pavona							
49.	P. maldivensis (Gardiner)	-	-	-	?x	-	-	-
50.	P. varians (Verrill)	x	-	x	x	x	x	-
51.	P. decussata (Dana)	x	x	x	x	x	-	x
	Subgenus Polyastra							
52.	P. (Polyastra) venosa (Ehrenberg)	-	-	-	-	x	-	-
	Genus Pachyseris							
53.	P. rugosa (Lamarck)	-	-	-	x	x	x	x
	Genus Siderastrea							
54.	S. radians (Pallas)	-	x	-	-	-	-	-
55.	S. savignyana Milne Edwards and Haime	x	-	-	-	-	-	-
	Genus Coscinaraea							
56.	C. monile (Forskål)	x	-	-	-	-	-	-

Table XII (contd.)

S.No.	Name of the species	Red Sea	Singapore	Cocos-Keeling Islands	Palau Islands	Low Isles	Marshall Islands	Samoa
	Genus Goniopora							
57.	G. stokesi Milne Edwards and Haime	-	-	-	-	-	-	-
58.	G. diiboutiensis Vaughan	-	-	-	-	-	-	-
59.	G. duofaciata Thiel	-	-	-	-	-	-	-
60.	G. nigra new name	-	-	-	-	-	-	-
	Genus Porites							
61.	P. solida (Forskal)	x	-	x	-	-	-	-
62.	P. fragosa Dana	-	-	-	-	-	x	-
63.	P. mannarensis new name	-	-	-	-	-	-	-
64.	P. lutea Milne Edwards and H aime	x	x	x	x	x	x	x
65.	P. somaliensis Gravier	x	-	x	x	-	-	-
66.	P. lichen Dana	-	-	x	x	-	x	-
67.	P. exserta new name	-	-	-	-	-	-	-
68.	P. compressa Dana	-	-	-	x	-	-	-
69.	P. nodifera (Klunzinger)	x	-	-	-	-	-	-
	Genus Favia							
70.	F. stelligera (Dana)	x	-	x	x	x	x	x
71.	F. favus (Forskal)	x	-	-	x	-	x	x
72.	F. speciosa (Dana)	x	x	x	x	x	x	x
73.	F. pallida (Dana)	-	-	-	x	x	x	x
74.	F. valenciennesii(Milne Edwards and Haime)	x	-	-	-	x	x	-

Table XII (contd.)

S.No.	Name of the species	Red Sea	Singapore	Cocos-Keeling Islands	Palau Islands	Low Isles	Marshall Islands	Samoa
	Genus Plesiastrea							
75.	P. versipora (Lamarck)	-	-	x	x	x	x	x
	Genus Favites							
76.	F. abdiata (Ellis and Solander)	x	x	x	x	x	x	x
77.	F. virens (Dana)	-	-	-	x	x	x	-
78.	F. halicora (Ehrenberg)	x	-	-	-	x	x	x
79.	F. pentagona (Esper)	-	-	-	-	-	-	-
80.	F. melicerum (Ehrenberg)	x	-	x	-	-	-	-
81.	F. complanata (Ehrenberg)	x	-	-	x	x	-	-
	Genus Goniastrea							
82.	G. retiformis (Lamarck)	x	-	-	x	x	x	x
83.	G. incrustans Duncan	-	-	-	-	-	-	-
84.	G. pectinata (Ehrenberg)	x	x	x	x	x	x	x
	Genus Platygyra							
85.	P. lamellina (Ehrenberg)	x	x	-	x	x	x	x
	Genus Leptoria							
86.	L. phrygia (Ellis and Solander)	-	x	x	-	x	x	x
	Genus Hydnophora							
87.	H. exesa (Pallas)	x	x	x	x	-	x	x
88.	H. microconos (Lamarck)	x	-	x	x	x	x	x
89.	H. grandis Gardiner	-	-	-	-	-	-	-

Table XII (contd.)

S.No.	Name of the species	Red Sea	Singapore	Cocos-Keeling Islands	Palau Islands	Low Isles	Marshall Islands	Samoa
	Genus Leptastrea							
90.	L. purpurea (Dana)	x	-	x	x	x	x	x
91.	L. transversa (Klunzinger)	x	-	-	-	x	x	x
	Genus Cyphastrea							
92.	C. serailia (Forskål)	x	-	-	x	x	x	-
93.	C. chalcidicum (Forskål)	x	x	x	-	x	x	x
94.	C. microphthalma (Lamarck)	x	-	x	x	x	-	x
	Genus Echinopora							
95.	E. lamellosa (Esper)	x	x	x	x	x	x	-
96.	E. gemmacea (Lamarck)	x	x	-	-	-	-	-
	Genus Culicia							
97.	C. rubeola (Quoy and Gaimard)	-	-	x	-	-	x	-
	Genus Galaxea							
98.	G. fascicularis (Linnaeus)	x	-	-	x	x	x	x
99.	G. clavus (Dana)	-	-	-	x	x	-	-
	Genus Merulina							
100.	M. ampliata (Ellis and Solander)	x	x	-	x	x	x	x
	Genus Symphyllia							
101.	S. recta (Dana)	-	x	-	x	x	x	x
102.	S. radians Milne Edwards and Haime	-	x	-	-	x	-	-

Table XII (contd.)

S.No.	Name of the species	Red Sea	Singapore	Cocos-Keeling Islands	Palau Islands	Low Isles	Marshall Islands	Samoa
	Genus Mycedium							
103.	M. tubifex (Dana)	-	x	-	x	x	x	-
	Genus Trochocyathus							
104.	T. sp.							
	Genus Paracyathus							
105.	P. parvulus Gardiner	-	-	-	-	-	x	-
	Genus Endopsammia							
106.	E. philippinensis Milne-Edwards and Haime	-	-	-	-	x	-	-
	Genus Dendrophyllia							
107.	D. aurea (Quoy and Gaimard)	-	x	x	-	-	-	x
108.	D. robusta (Bourne)	-	-	-	-	-	-	-
	Genus Turbinaria							
109.	T. crater (Pallas)	-	x	-	x	-	x	-
110.	T. ?frondens (Dana)	-	-	-	-	x	-	-
111.	T. peltata (Esper)	-	x	-	x	x	-	-
112.	T. mesenterina (Lamarck)	x	-	-	-	-	x	-

x = present
- = not recorded.

SUMMARY

The present work entitled 'Studies on corals' (Systematic and ecological studies on the stony corals of the seas around India) was carried out at the suggestion and guidance of Dr. S. Jones, Director, Central Marine Fisheries Research Institute, Mandapam Camp, during the period 1964 April to 1967 April. Corals from the Laccadives, Tuticorin, Palk Bay and Gulf of Mannar around Mandapam and Andaman Islands were studied and a total of 125 species belonging to 34 genera and 1 subgenus were described in detail. Photographic illustrations are given for all the forms described herein except for a few species that are well known. Three species are described as new to science, while names are suggested for one Goniopora and two Porites already described but not named according to binomial system.

A btief account of the horizontal distribution of corals and the factors that probably control their zoning on the fringing reefs of Palk Bay (Mandapam) are described. The composition of the coral fauna around Mandapam is also discussed.

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**Not cited in the text.

EXPLANATION OF PLATE I

Fig. 1. Mandapam and adjacent areas in Gulf of Mannar and Palk Bay.

Fig. 2. The reefs of Palk Bay at Mandapam. The arrow indicates the position of the traverse mentioned in Part II Chapter I.

Fig. 3. South India showing the areas from which collections are made.

PLATE I

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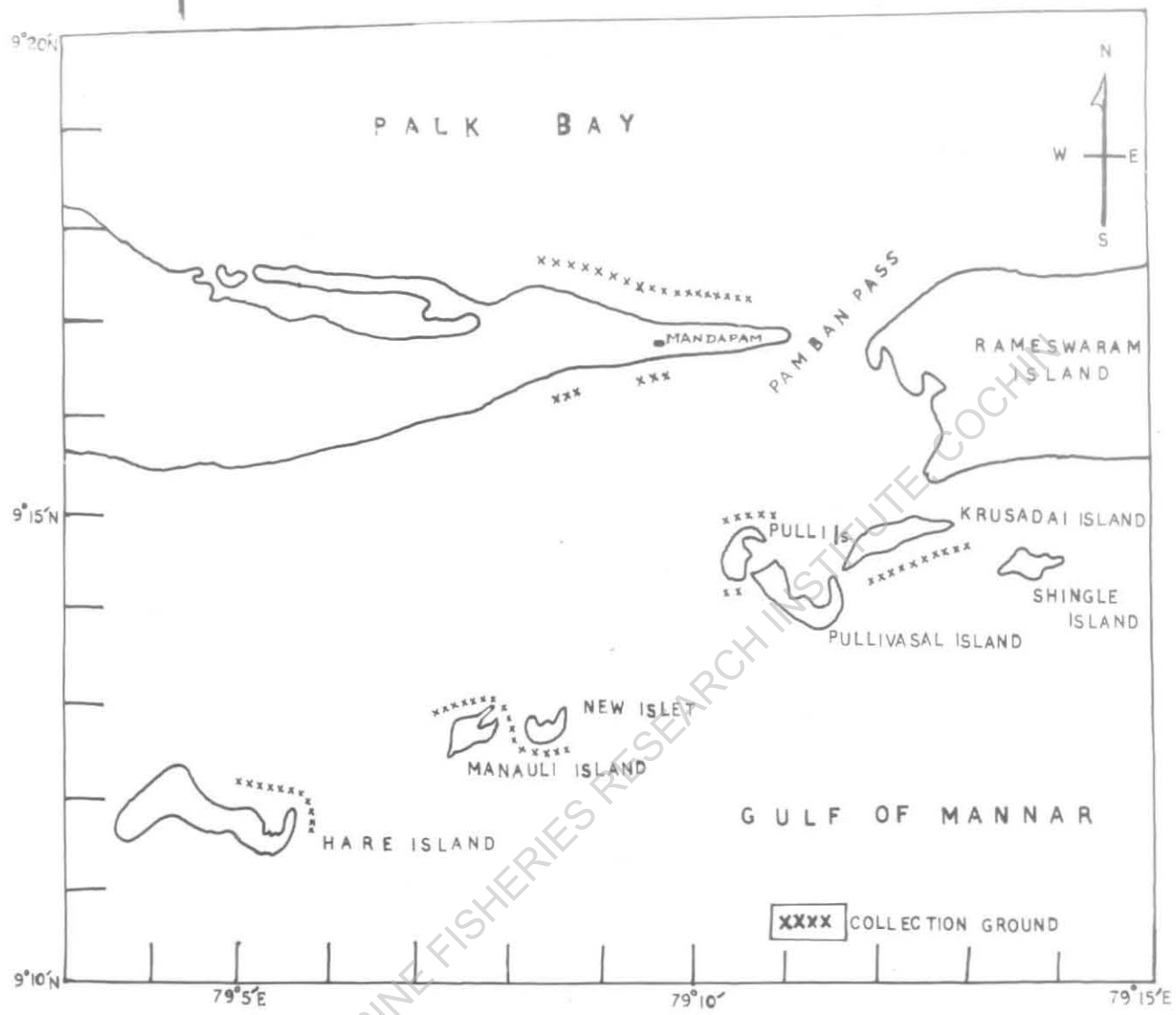

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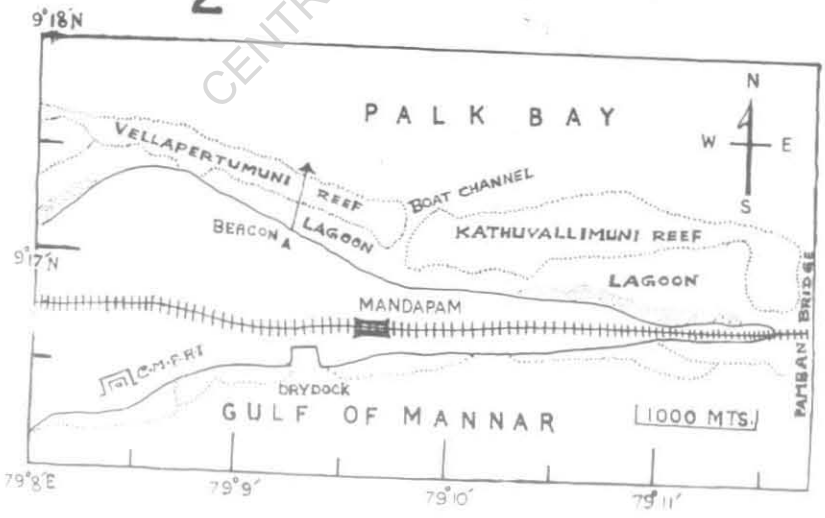

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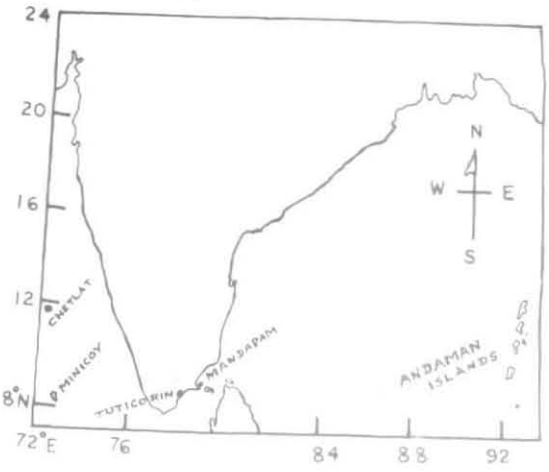


EXPLANATION OF PLATE II

Fig. 1. Psammocora contigua (Esper), part of a specimen from Krusadai Island x 0.75.

Fig. 2. Pocillopora brevicornis (Lamarck), from Andamans Islands x 0.5.

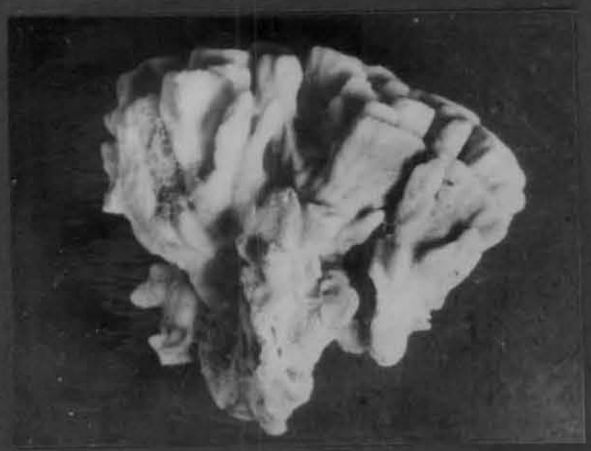
Fig. 3. Stylophora mordax (Dana), from Chetlat x 0.9

Figs.4-5. Pocillopora damicornis (Linnaeus).

Fig. 4. An entire colony from Andamans x 0.5

Fig. 5. A branch from Manauli Island x 0.75

PLATE II



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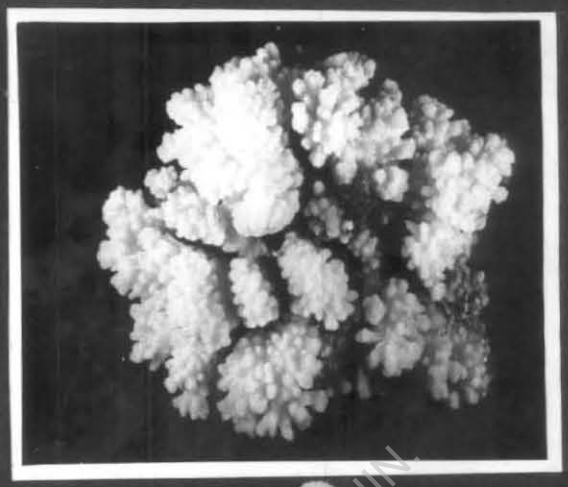

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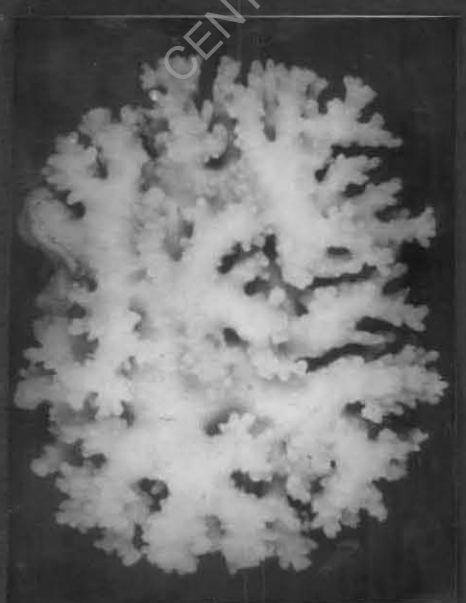

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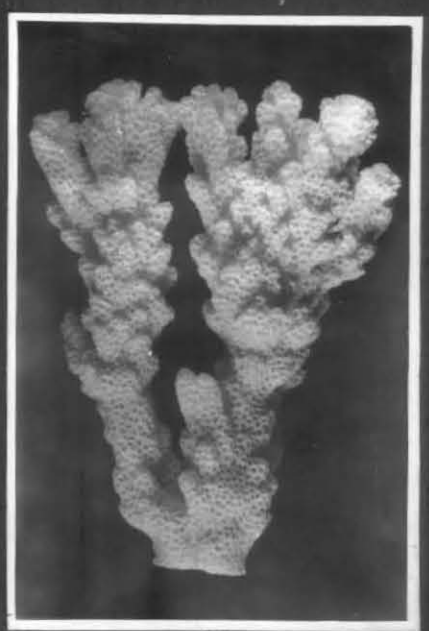

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EXPLANATION OF PLATE III

Fig. 1. Pocillopora danae Verrill, a branch from Manauli Island x 1.

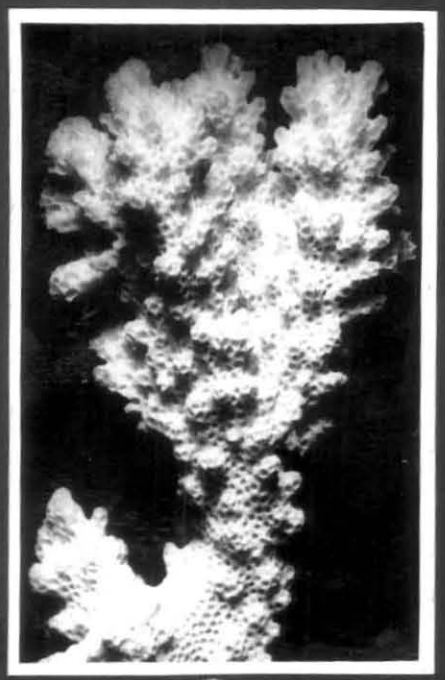
Fig. 2. Pocillopora verrucosa (Ellis and Solander). Part of a specimen from Andamans x 1.

Fig. 3. Pocillopora eydouxi Milne Edwards and Haime, a clump from Keelakarai (Gulf of Mannar) x 1.

Fig. 4. Acropora formosa (Dana), a branch from Mandapam(Palk Bay) x 1.

Fig. 5. Acropora intermedia (Brook), part of a specimen from Mandapam (Palk Bay) x 1.

PLATE III



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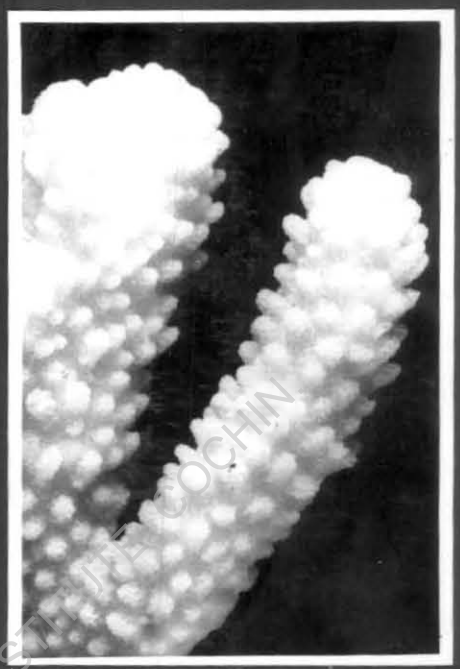

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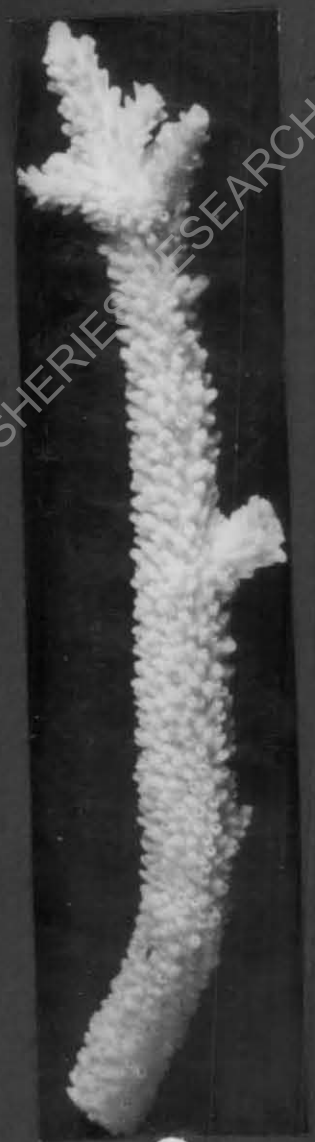

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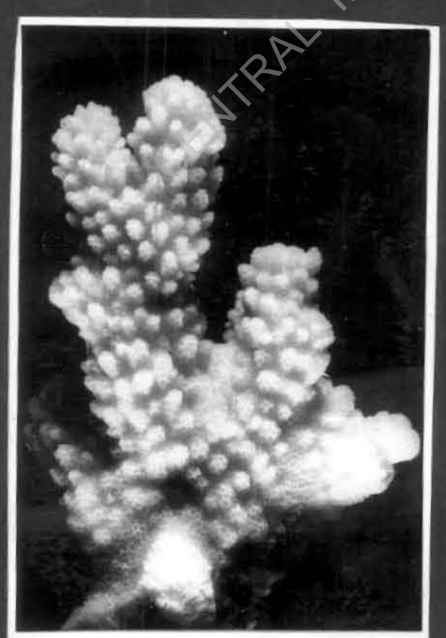

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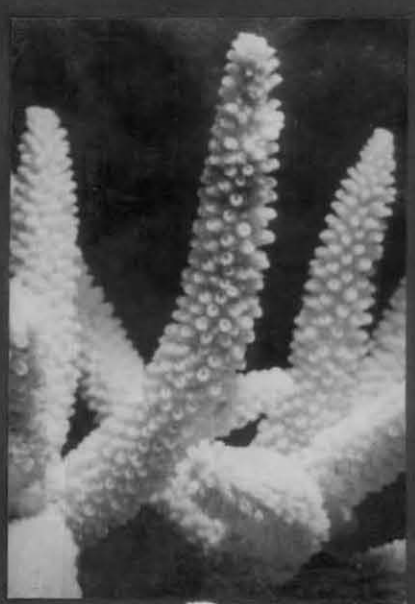


5

EXPLANATION OF PLATE IV

Fig. 1. Acropora haimei (Milne Edwards and Haime), branches from two different colonies from Mandapam (Palk Bay) x 1.

Figs.2-3. Acropora nobilis (Dana)

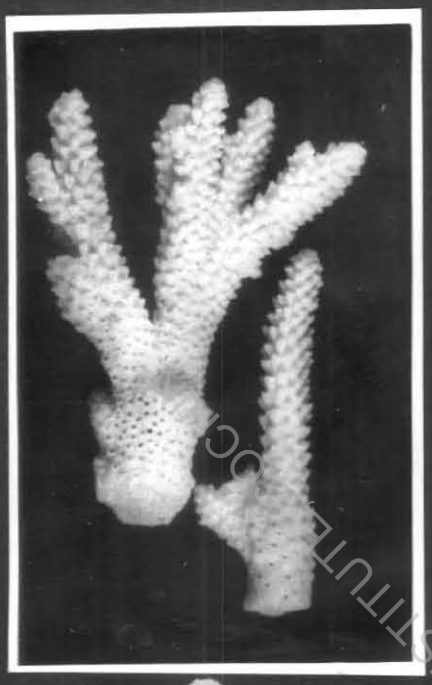
Fig. 2. Upper part of a branch with thick axial corallites and irregular radial corallites, from Hare Island x 1.

Fig. 3. Another clump from the same colony figured in Fig. 2; showing uniform sized radials x 0.7

Fig. 4. Acropora multicaulis (Brook) part of a corallum from Pulli Island x 1.

Fig. 5. Acropora thurstoni (Brook), part of a colony from Mandapam (Palk Bay) x 1.

PLATE IV



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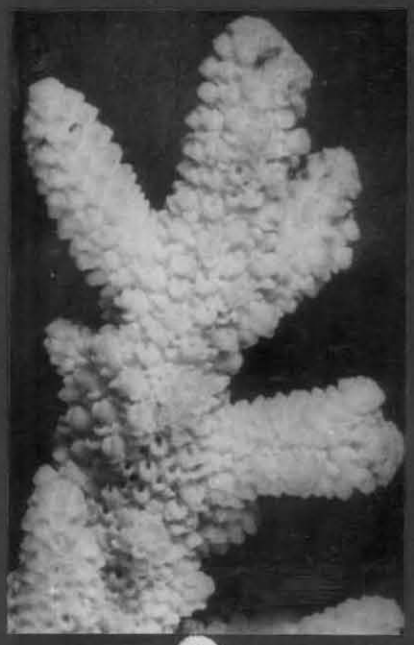

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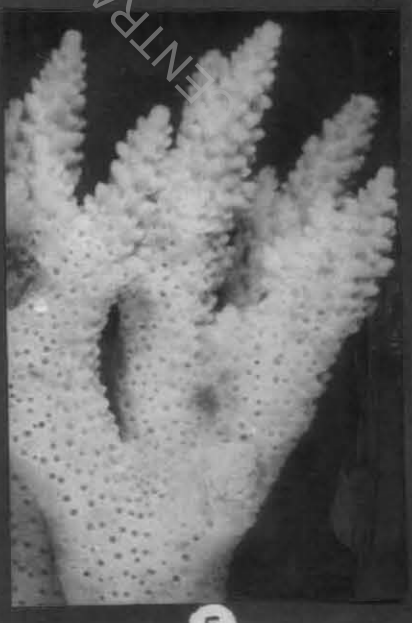

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EXPLANATION OF PLATE V

Fig. 1. Acropora obscura (Brook) upper branches of a colony from Mandapam (Palk Bay) x 1.

Fig. 2. Acropora sp., peripheral part of a corallum from Mandapam (Palk Bay) x 0.5

Fig. 3. Acropora spicifera (Dana) a branch from Krusadai Island x 1.

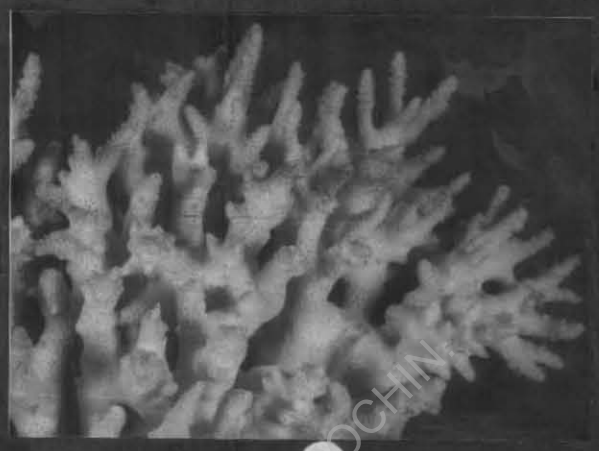
Fig. 4. Acropora corymbosa (Lamarck), upper part of a colony in which the horizontal branches fused into a thick plate; from Mandapam (Palk Bay) x 1.

Fig. 5. Acropora surculosa (Dana), peripheral part of a large colony from Manauli Island x 1.

Fig. 6. Acropora hyacinthus (Dana), part of a corallum from Mandapam (Palk Bay) x 1.

PLATE V

1



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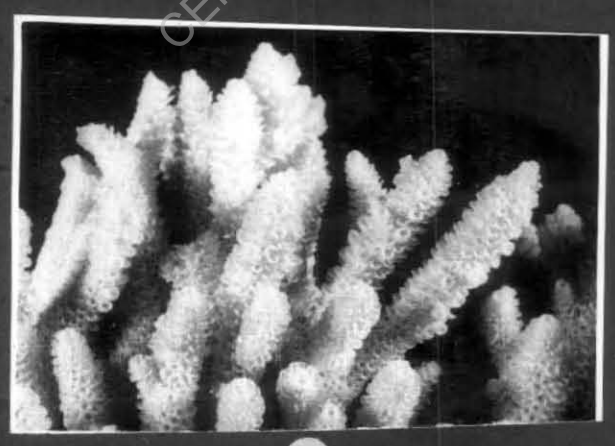

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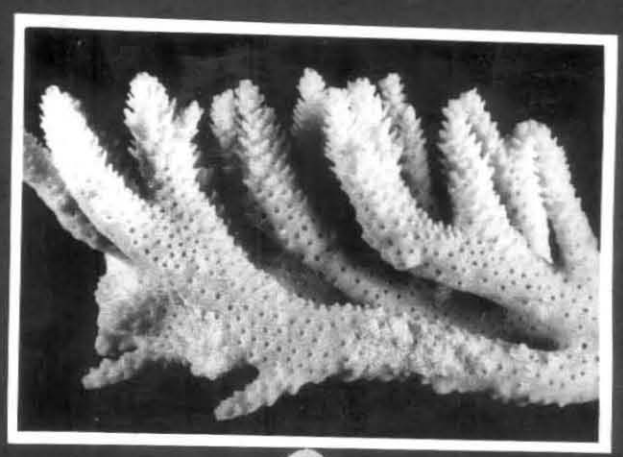

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EXPLANATION OF PLATE VI

Fig. 1. *Acropora* sp. cf. *exigua* (Dana), a branch with branchlets from Mandapam (Palk Bay) x 1.

Figs. 2-3. *Acropora indica* (Brook) from Manauli Island.

Fig. 2. Entire colony x 0.25

Fig. 3. Same a part x 1.

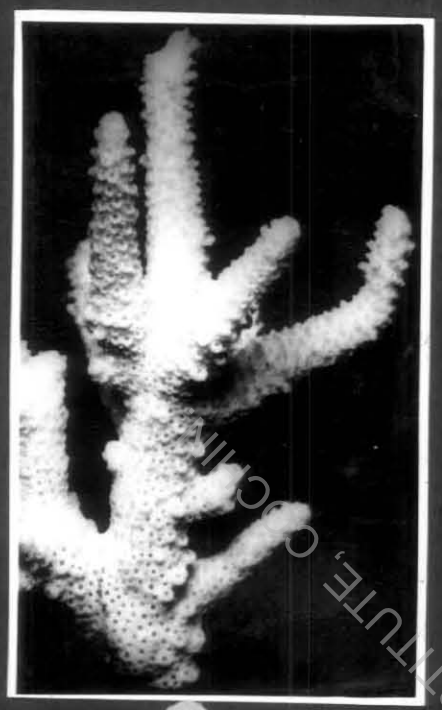
Fig. 4. *Acropora hebes* (Dana), part of a specimen from Andaman Islands x 1.

Figs. 5-6. *Acropora squamosa* (Brook), from Mandapam (Palk Bay)

Fig. 5. Three branches from three different colonies x 1.

Fig. 6. Upper portion of a branch with several proliferations x 1.

PLATE VI



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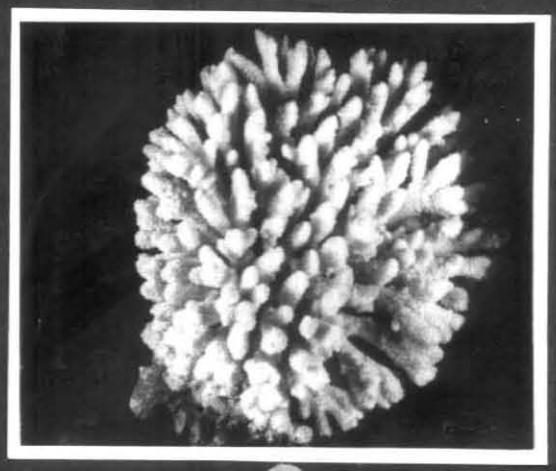

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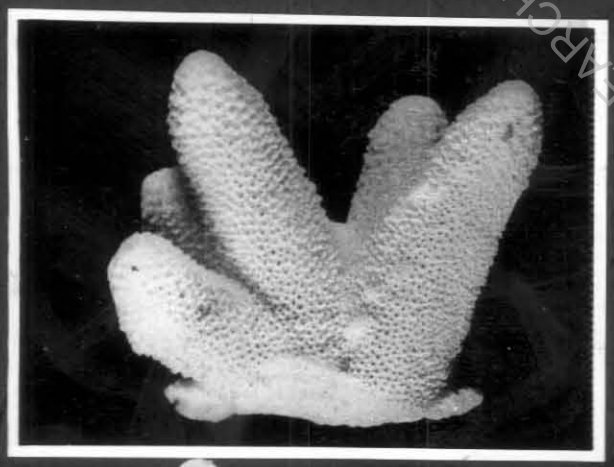

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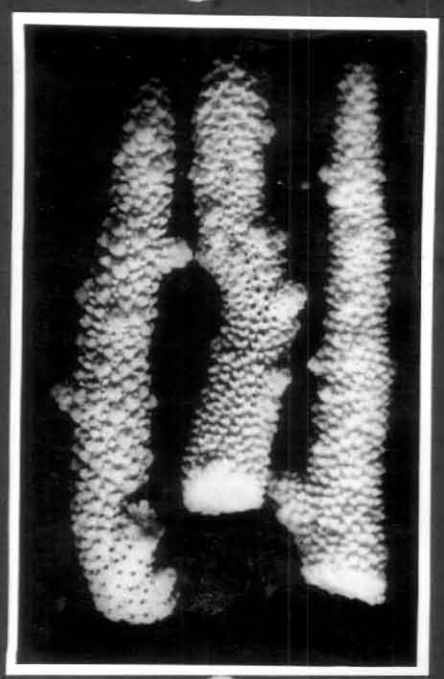

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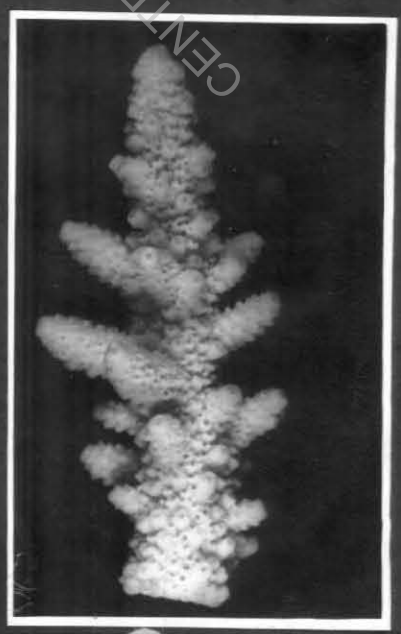

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EXPLANATION OF PLATE VII

Fig. 1. Acropora diversa (Brook), part of a specimen from Krusadai Island x 1.

Fig. 2. Acropora digitifera (Dana), from Mandapam (Palk Bay) x 1.

Fig. 3. Acropora variabilis (Klunzinger), from Andaman Islands x 1.

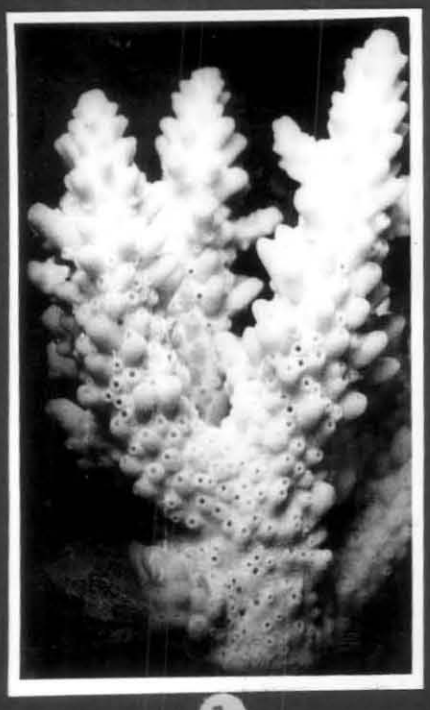
Figs.4-6. Acropora erythraea (Klunzinger).

Fig. 4. Part of a specimen from Manauli x 1.

Fig. 5. A clump from a colony from Hare Island x 1.

Fig. 6. Part of a slender stemmed colony from Pulli Island x 1.

PLATE VII



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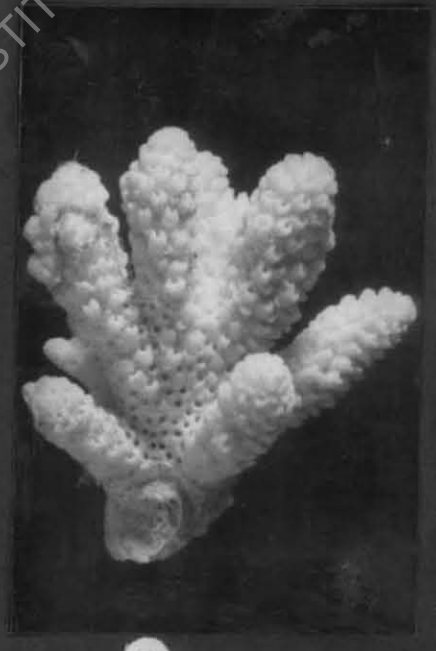

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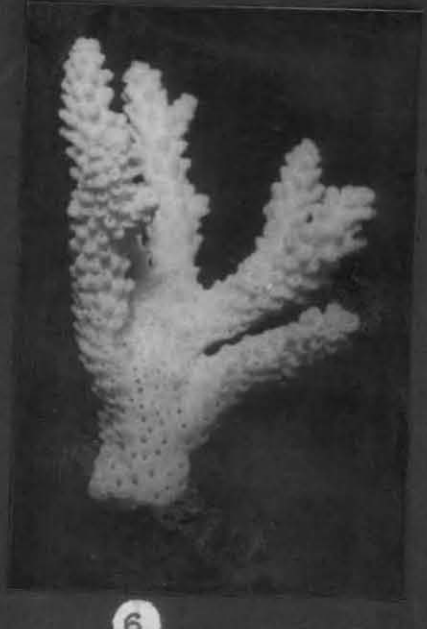

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EXPLANATION OF PLATE VIII

Fig. 1. Acropora ceylonica (Ortmann), the figure on the right hand side shows the top portion of an upper central branch from a colony. The figure on the left hand side shows the basal part of another branch from the same colony, from Manauli Island x 1.

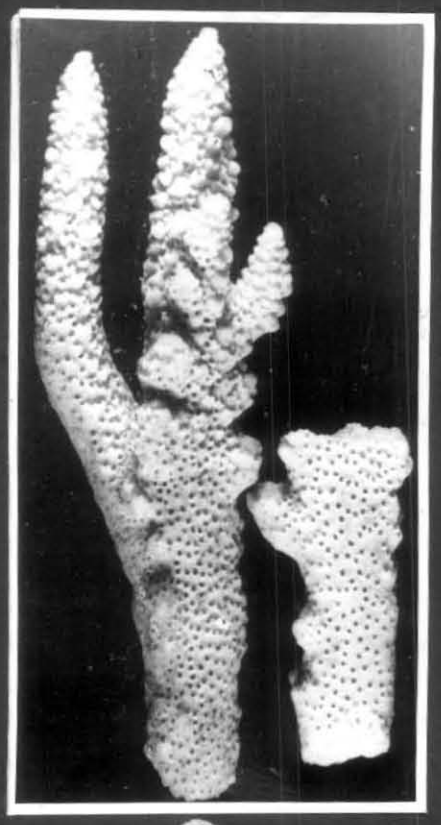
Fig. 2. Acropora polymorpha (Brook), part of a corallum from Mandapam (Palk Bay) x 0.5

Fig. 3. Acropora syringodes (Brook), part of a colony from Andaman Islands x 1.

Fig. 4. Acropora echinata (Dana), basal portion of a specimen from the vicinity of Mandapam x 1.

Fig. 5. Acropora procumbens (Brook), part, from Andamans x 1.

PLATE VIII



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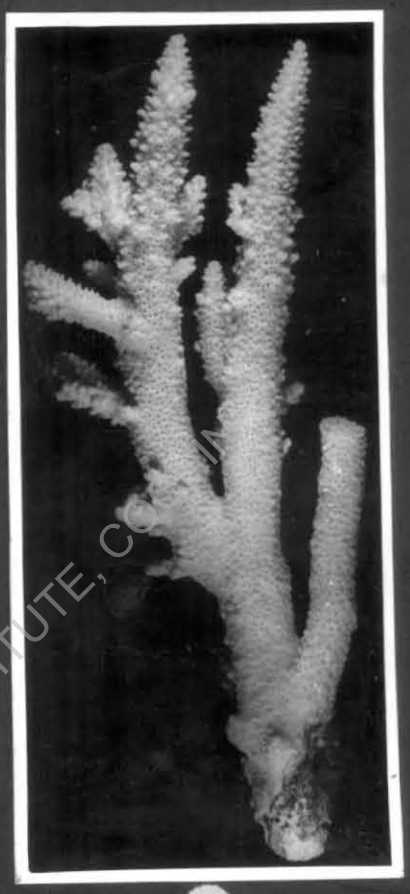

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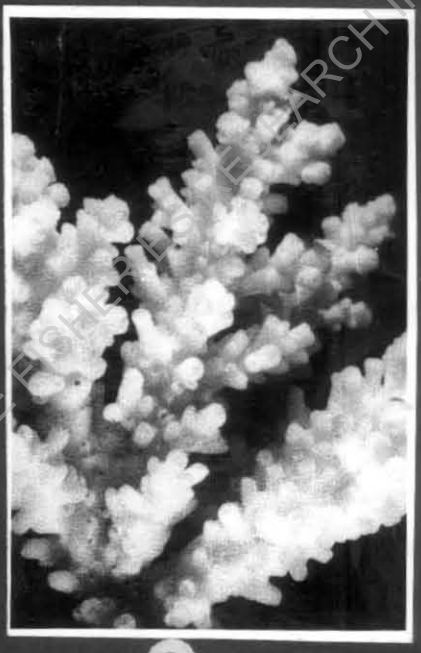

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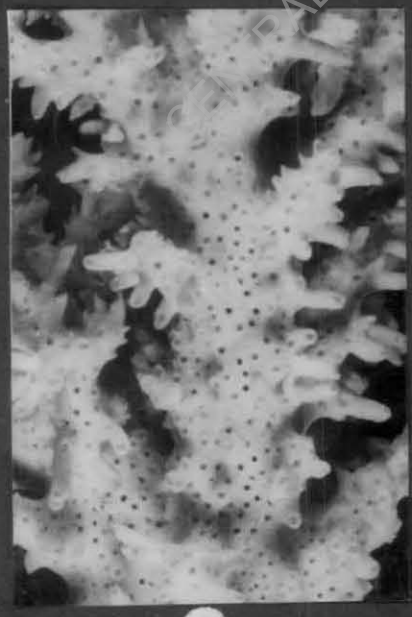

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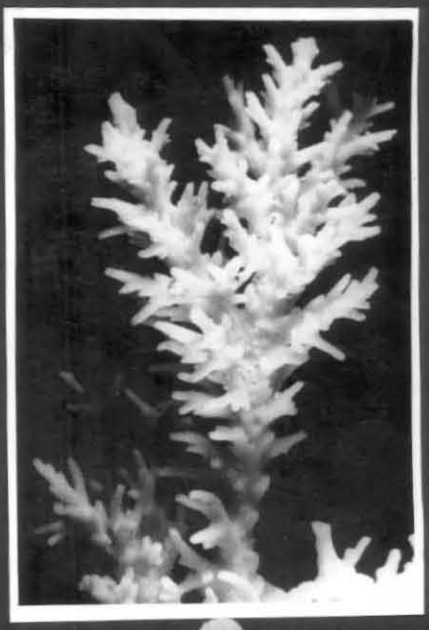

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EXPLANATION OF PLATE IX

Fig. 1. Montipora subtilis Bernard, from Manauli Island x 4.

Fig. 2. Montipora granulosa Bernard, from Manauli x 4.

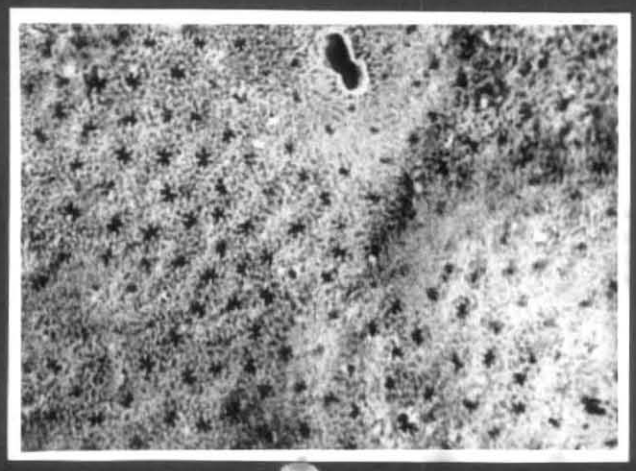
Fig. 3. Montipora explanata Bruggemann, from Mandapam (Palk Bay) x 4.

Fig. 4. Montipora exserta Quelch, from Mandapam (Palk Bay) x 4.

Fig. 5. Montipora digitata (Dana), part of a colony from Krusadai Island with tapering branchlets x 1.

Fig. 6. Montipora turgescence Bernard, from Manauli x 4.

PLATE IX



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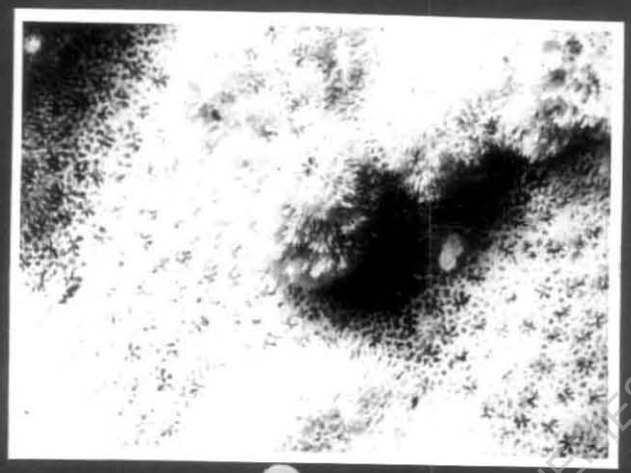

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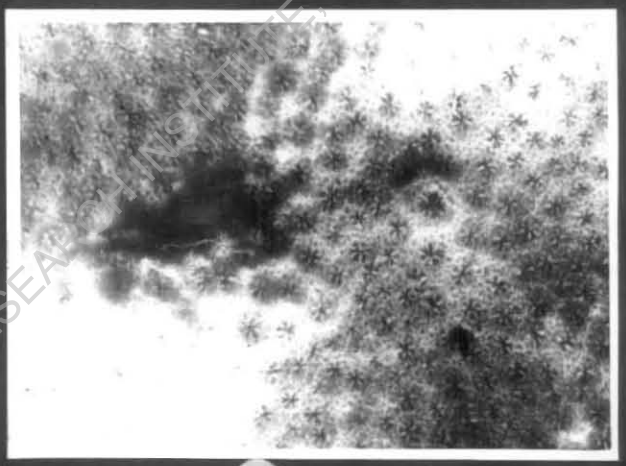

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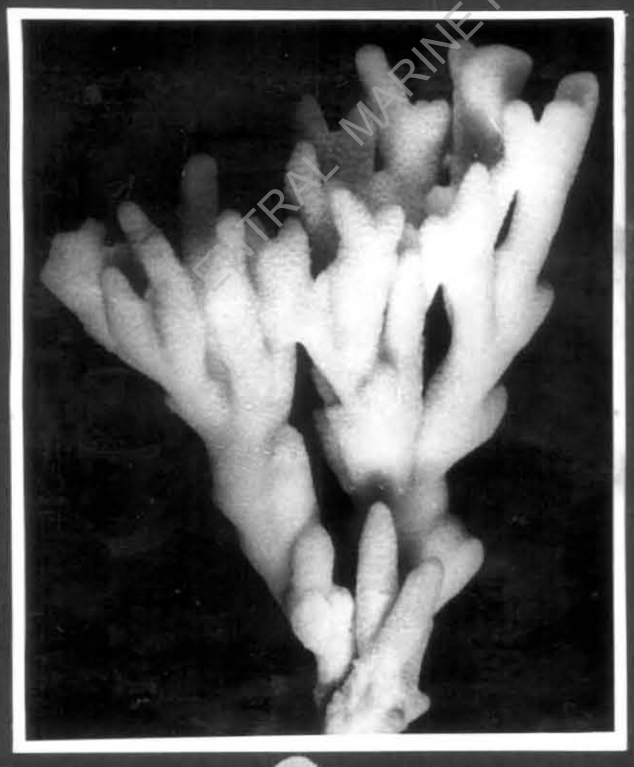

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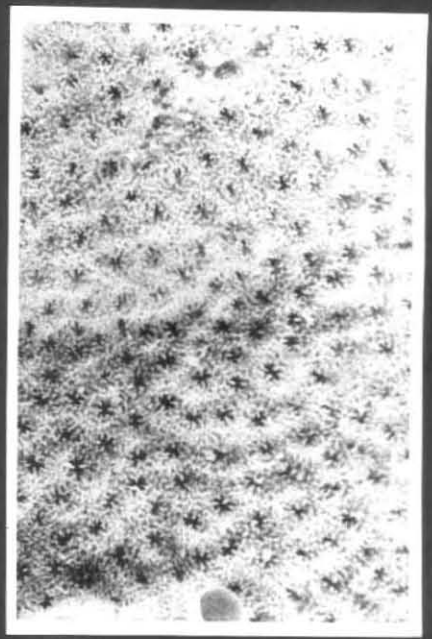

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EXPLANATION OF PLATE X

Fig. 1. Montipora turgescens Bernard, another portion of the specimen figured in Pl. IX, Fig. 6, showing closely set, weakly developed calices x 4.

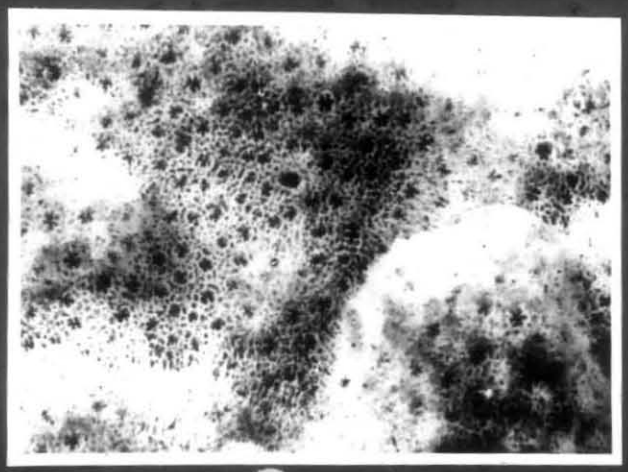
Fig. 2-3. Montipora manauliensis sp. nov. from Manauli Island.
Fig. 2. Holotype entire x 0.28
Fig. 3. Same calices from the top of the colony x 4

Fig. 4. Montipora elscheneri Vaughan, from Hare Island x 4.

Fig. 5. Montipora monasteriata (Forskål), upper portion of a colony with several slender branches, from Mandapam (Gulf of Mannar) x 1.

Fig. 6. Montipora venosa (Ehrenberg), part of a colony from Krusadai Island x 4.

PLATE X



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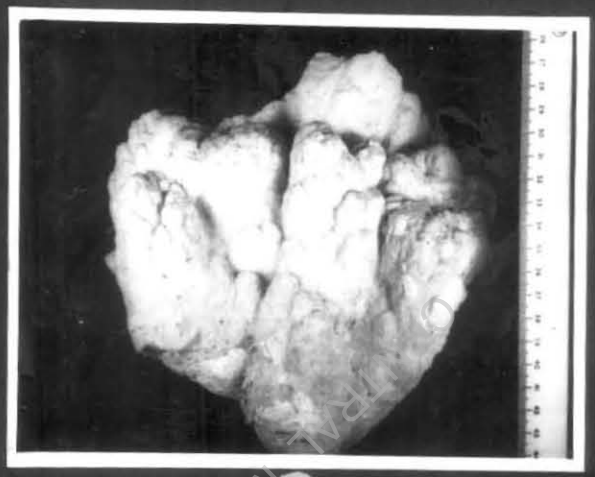

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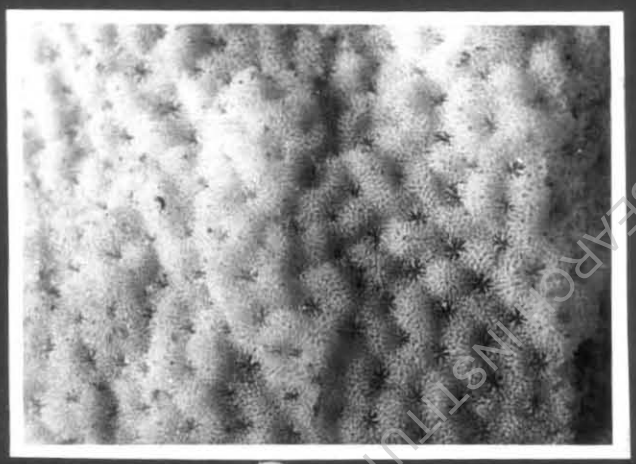

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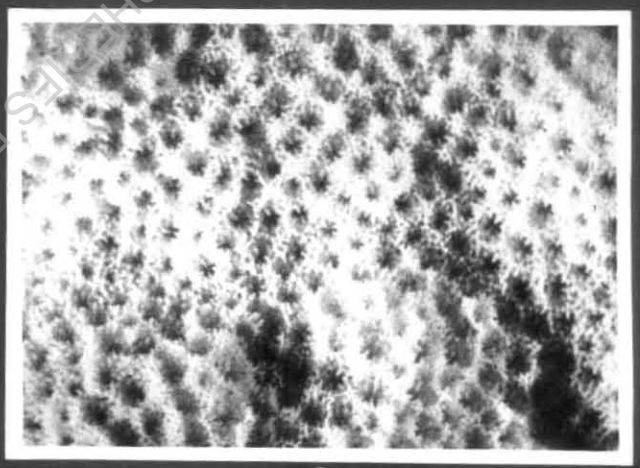

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EXPLANATION OF PLATE XI

Fig. 1. Montipora spumosa (Lamarck), top part of a specimen with several digitiform branches from Manauli Island x 0.5

Fig. 2. Montipora edwardsi Bernard, upper portion of a corallum from Mandapam (Palk Bay) x 0.5

Fig. 3. Montipora verrucosa (Lamarck), thick upper branches of a colony from Manauli Island x 1.

Fig. 4. Montipora informis Bernard, part of a corallum from Mandapam (Gulf of Mannar) x 1.

Fig. 5. Montipora verrilli Vaughan, from Manauli x 4.

Fig. 6. Montipora composita Crossland, from Mandapam (Palk Bay) x 4.

PLATE XI

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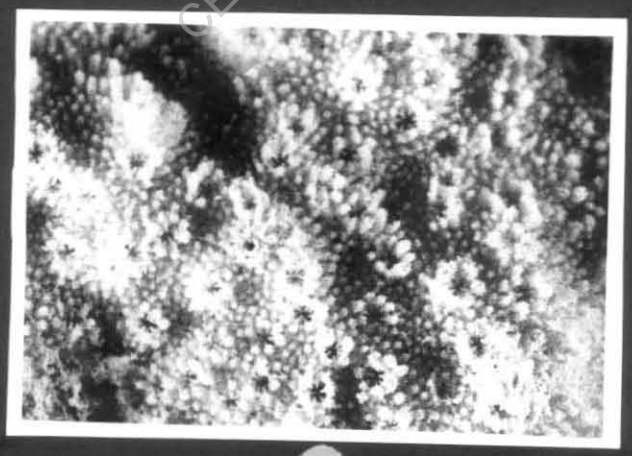

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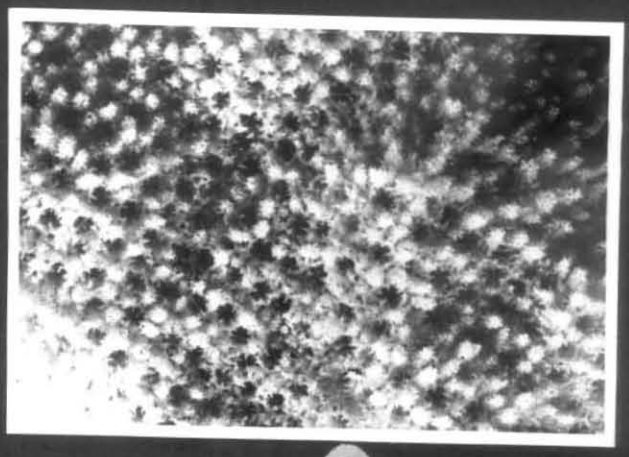

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EXPLANATION OF PLATE XII

Fig. 1. Pavona explanulata (Lamarck), from Andaman Islands, calicinal surface x 3.

Fig. 2. Pavona maldivensis (Gardiner), from Manauli Island x 3.

Fig. 3. Pavona decussata (Dana), a clump from a large colony from Manauli Island x 0.5

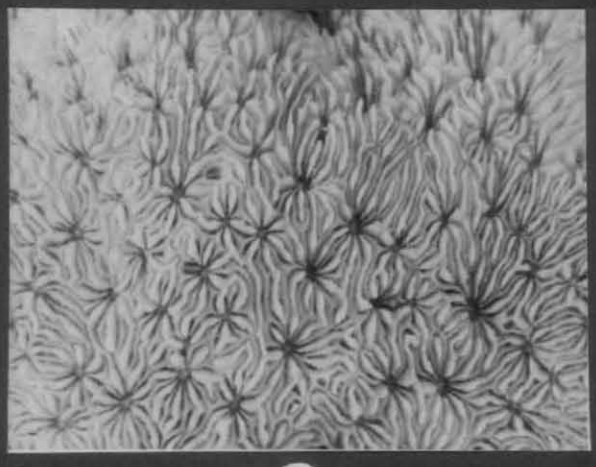
Fig.4-6. Pavona (Polyastra) venosa (Ehrenberg) from Krusadai Island.

Fig. 4. Basal part of a colony x 1.

Fig. 5. Another part of the base of the same x 1.

Fig. 6. Upper portion of branches x 1.5

PLATE XII



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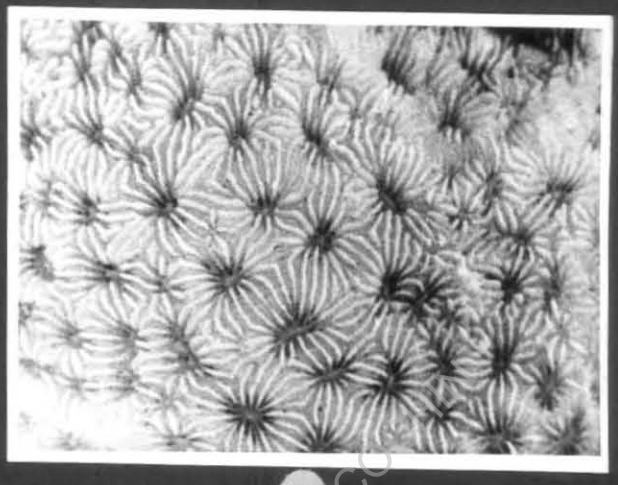

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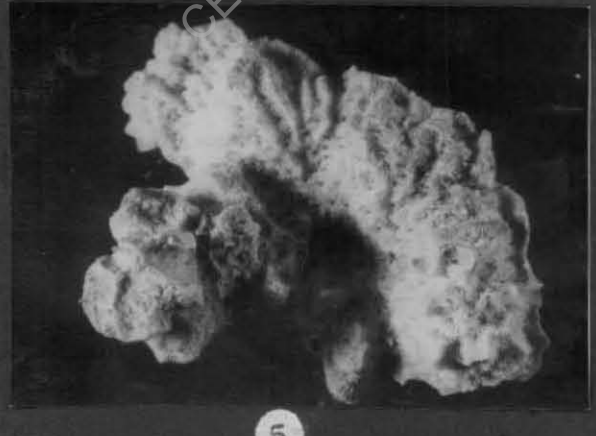

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EXPLANATION OF PLATE XIII

Fig. 1. *Pachyseris rugosa* (Lamarck), from Manauli Island, calicinal side x 2.

Fig. 2. *Siderastrea radians* (Pallas), from Pulli Island x 2.

Fig. 3. *Siderastrea savignyana* (Milne Edwards and Haime), from Manauli Island x 2.

Figs.4-5. *Coscinaraea monile* (Forskål), from Manauli Island.

Fig. 4. Part of a colony x 1.

Fig. 5. Part of another specimen with comparatively smaller calices x 1.

Fig. 6. *Cycloseris cyclolites* (Lamarck), from Tuticorin, calicinal view x 1.3

PLATE XIII

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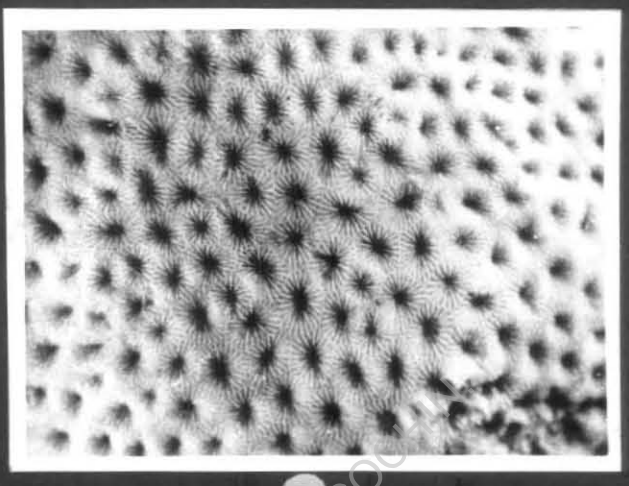

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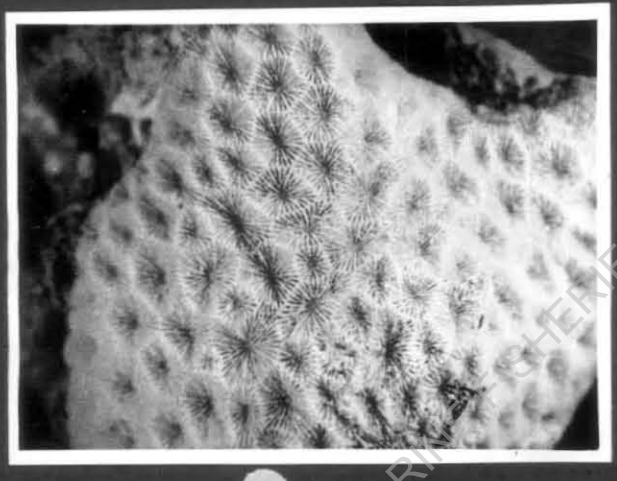

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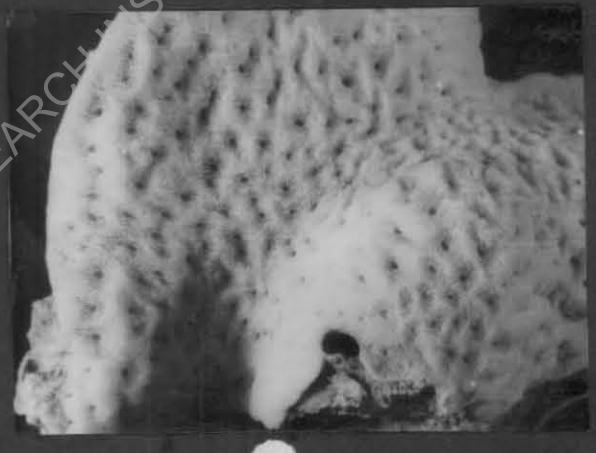

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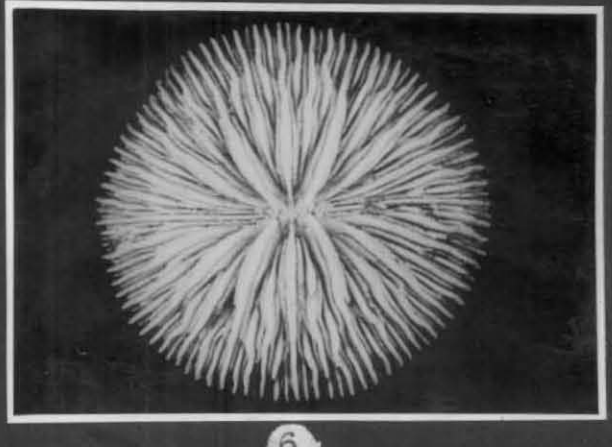

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EXPLANATION OF PLATE XIV

Fig. 1. Fungia scutaria Lamarck, from Chetlat Island; calicinal view with the axial fossa trifurcated x 0.5

Figs.2-3. Fungia fungites (Linnaeus), from Chetlat Island.

Fig. 2. Calicinal side x 1/3.

Fig. 3. Noncalicinal side x 1/3.

Fig. 4. Fungia horrida Dana, side view of a specimen from Andaman Islands x 0.6

Fig. 5. Podabacia crustacea (Pallas), from Minicoy; calicinal side x 1.

Fig. 6. Goniopora stokesi Milne Edwards and Haime, from Mandapam (Palk Bay) x 2.

PLATE XIV

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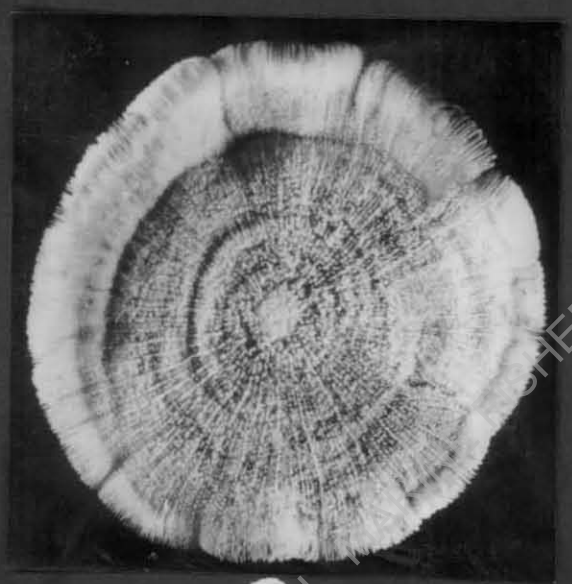

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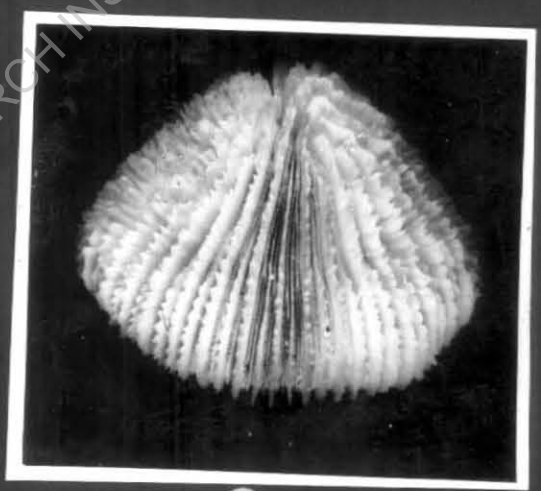

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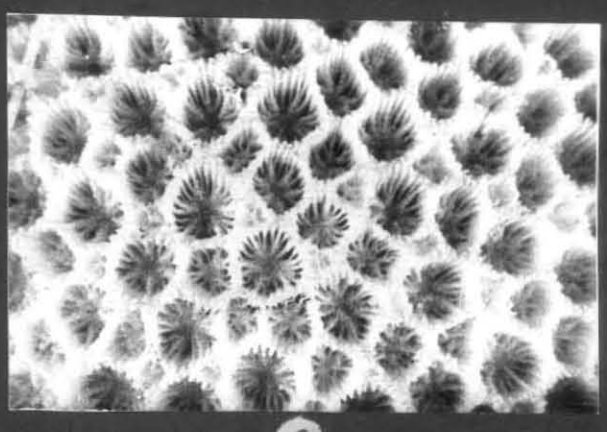

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EXPLANATION OF PLATE XV

Fig. 1. *Goniopora dijiboutiensis* Vaughan, from Manauli Island x 2.

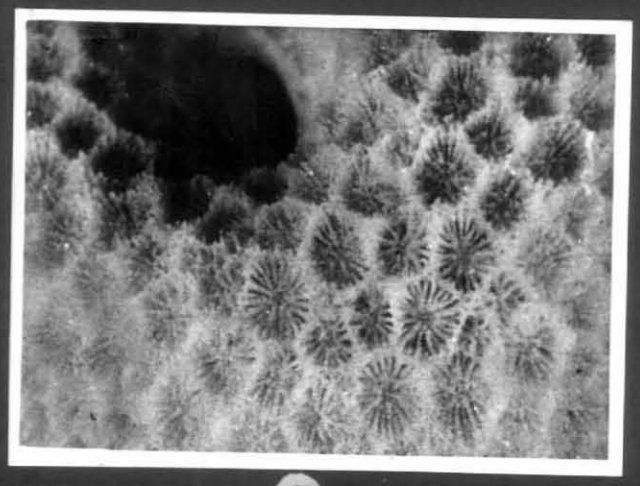
Figs. 2-3. *Goniopora nigra* new name, from Manauli Island.
Fig. 2. Calices from the periphery of a colony x 2.
Fig. 3. Calices from the top of a colony x 2.

Fig. 4. *Porites fragosa* Dana, from Manauli Island x 6.

Fig. 5. *Porites mannarensis* new name, calices from the basal part of a colony from Manauli Island x 6.

Fig. 6. *Porites lutea* Milne Edwards and Haime, from Mandapam (Palk Bay) x 6.

PLATE XV



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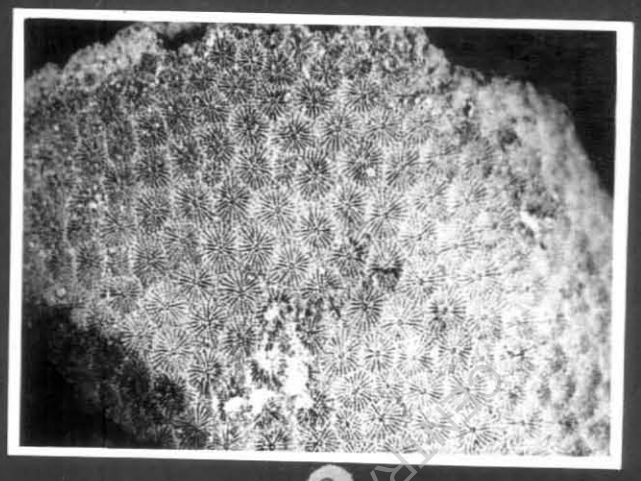

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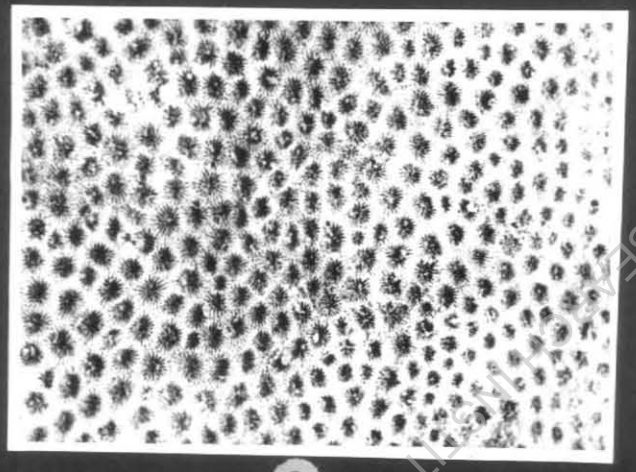

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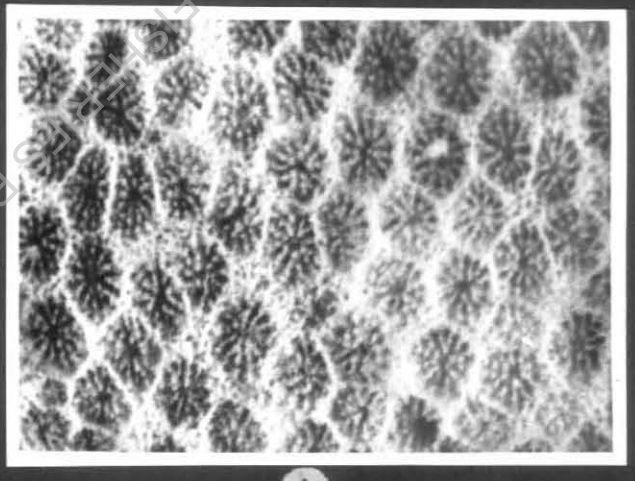

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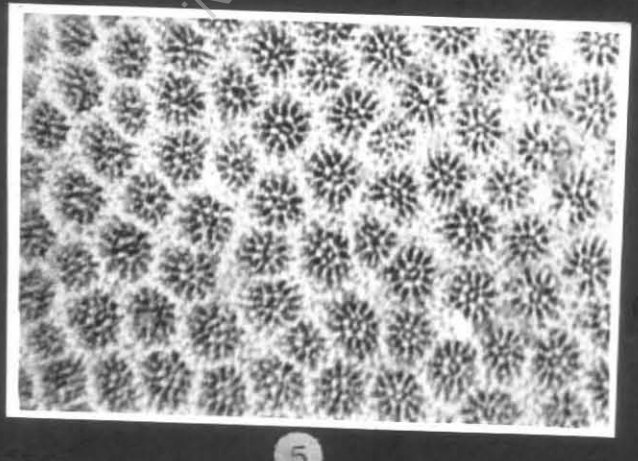

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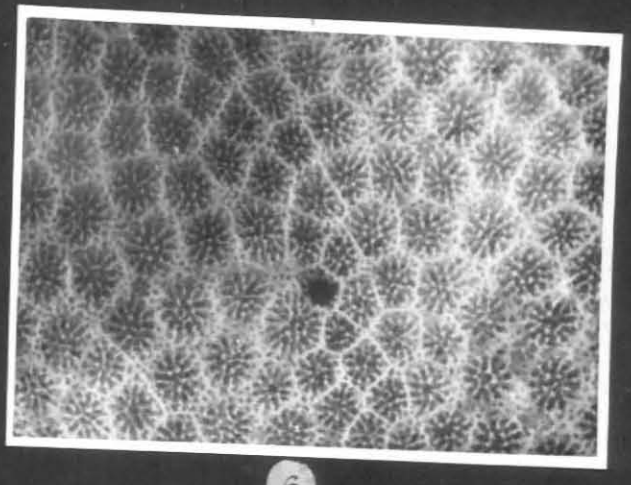

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EXPLANATION OF PLATE XVI

Figs.1-2. Porites somaliensis Gravier, from Manauli Island.

Fig. 1. An entire colony x ½.

Fig. 2. Calices of the same x 6.

Fig. 3. Porites andrewsi Vaughan, from Minicoy x 1.

Figs.4-5. Porites compressa Dana, from Krusadai Island.

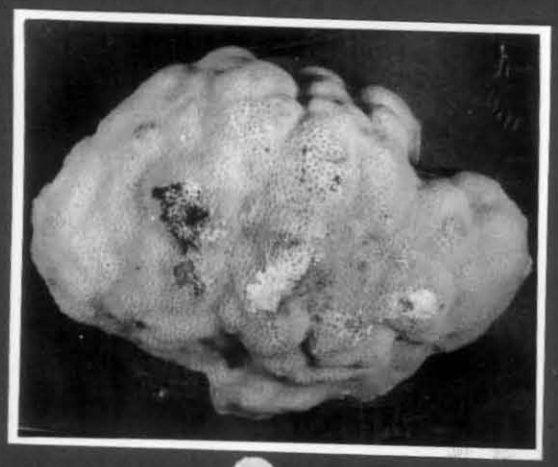
Fig. 4. A clump x 0.5

Fig. 5. Calices of the same from the basal part x 4.

Fig. 6. Porites exserta new name, from Manauli Island,

Calices x 8.

PLATE XVI



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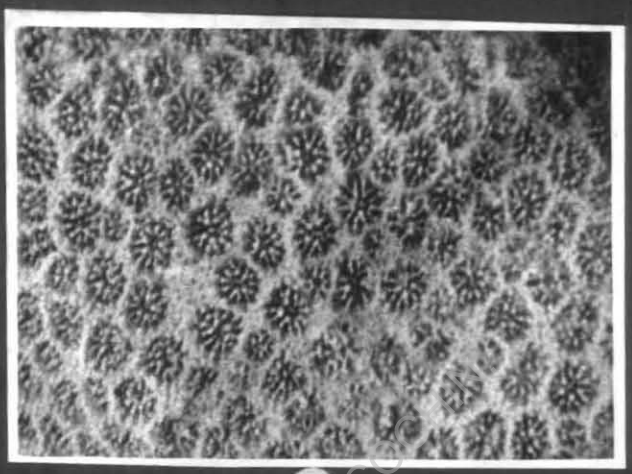

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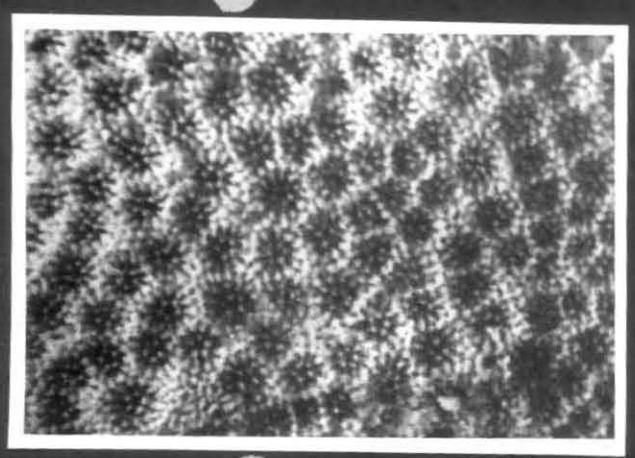

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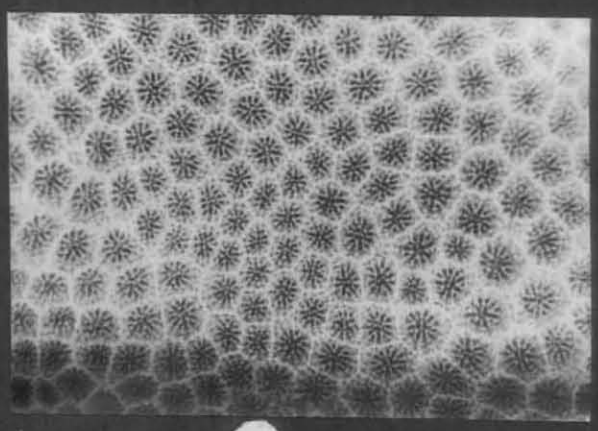

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EXPLANATION OF PLATE XVII

Figs.1-2. Porites jonesi new name, from Minicoy.

Fig. 1. Entire colony x 0.75

Fig. 2. Calices of the same x 6.

Fig. 3. Favia stelligera (Dana), from Manauli Island x 2.2

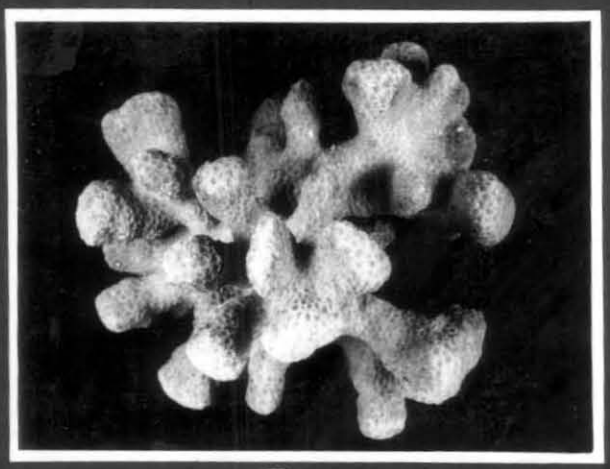
Figs.4-5. Favia favus (Forskål), from Mandapam (Palk Bay).

Fig. 4. Part of a colony x 1.

Fig. 5. Calices of another colony with beaded septal dentition x 2.

Fig. 6. Favia speciosa (Dana), from Manauli Island x 2.

PLATE XVII



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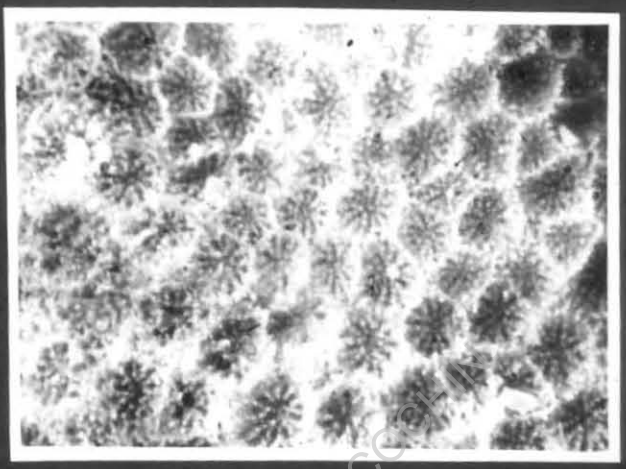

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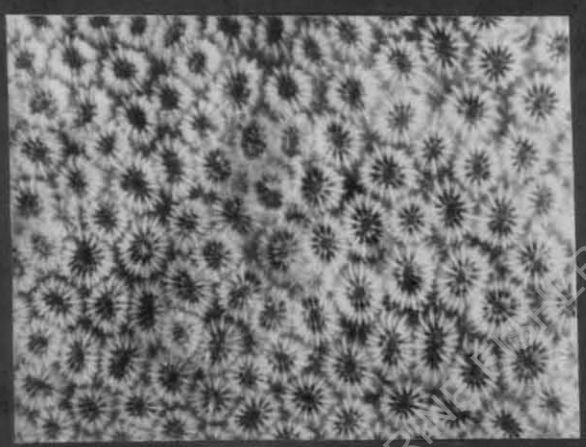

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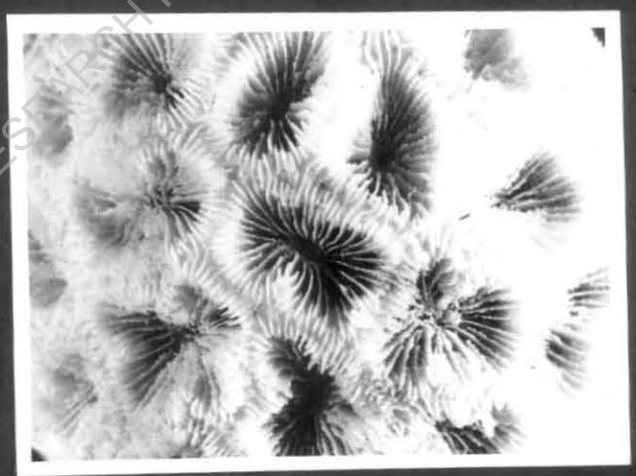

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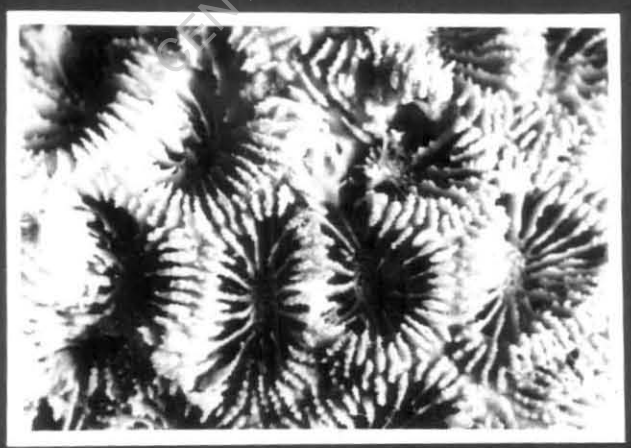

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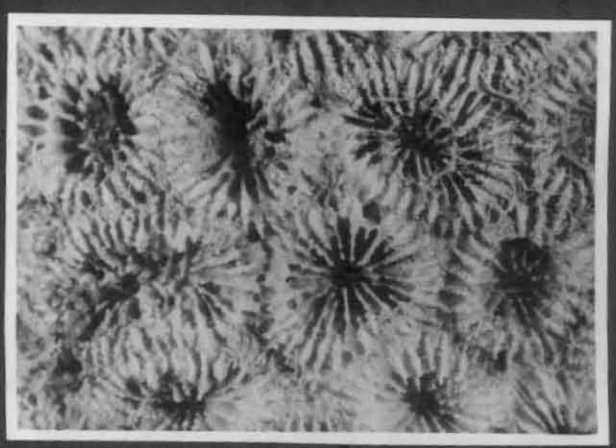

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EXPLANATION OF PLATE XVIII

Fig.1. Favia pallida (Dana) from Mandapam (Palk Bay), typical x 1.

Figs.2-4. Favia valenciennesii Milne Edwards and Haime, from Andaman Islands.

Fig. 2. Entire colony x 0.5

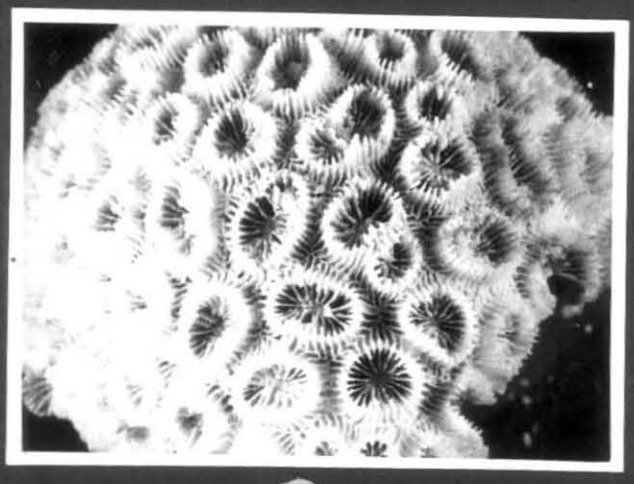
Fig. 3. Same calices x 1.5

Fig. 4. Same vertical section x 1.

Fig. 5. Favites virens (Dana), from Mandapam (Palk Bay). Part of a specimen with thin intercorallite wall x 1.

Fig. 6. Favites halicora (Ehrenberg), from Mandapam (Palk Bay), calices x 1.

PLATE XVIII



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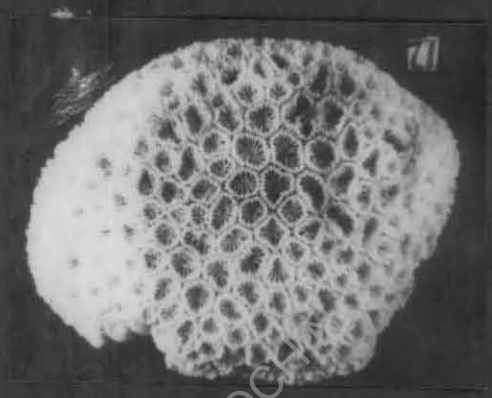

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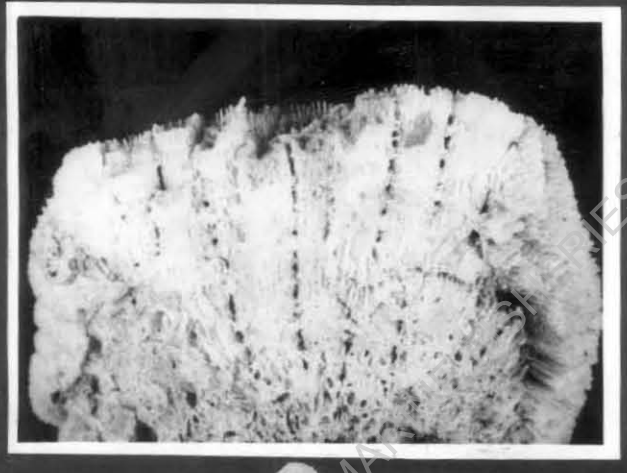

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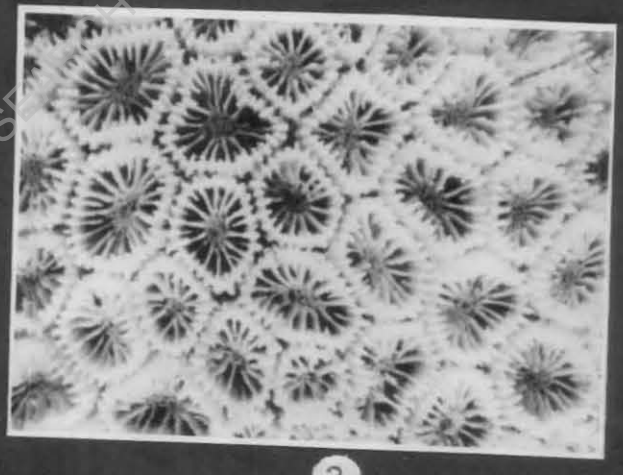

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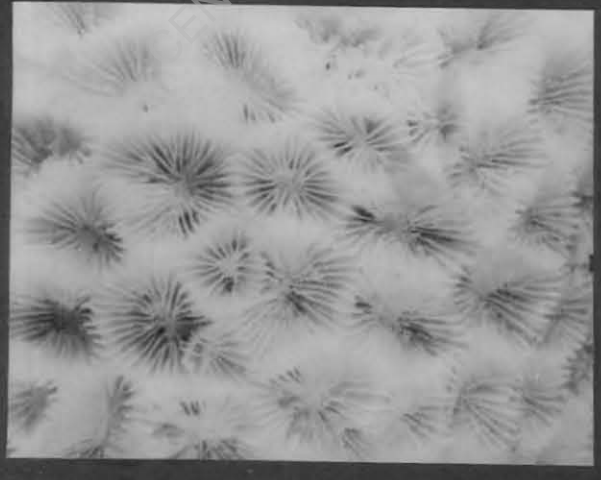

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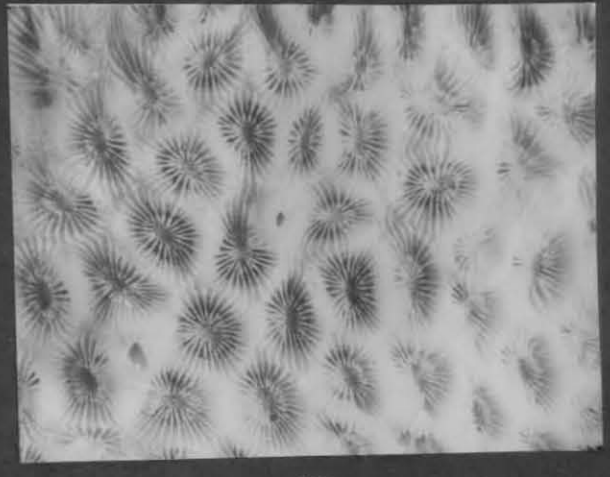

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EXPLANATION OF PLATE XIX

Fig. 1. Favites pentagona (Esper), from Manauli Island, corallites x 1.5

Fig. 2. Favites melicerum (Ehrenberg), from Mandapam (Gulf of Mannar) x 1.

Fig. 3. Goniastrea incrustans Duncan, from Manauli Island, part of a specimen x 1.

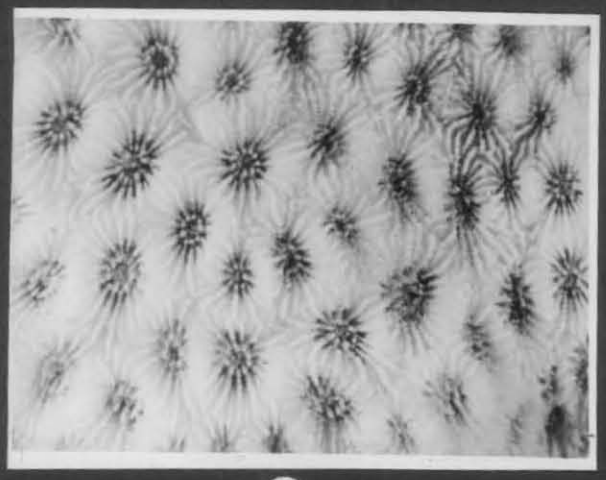
Figs.4-5. Goniastrea pectinata (Ehrenberg).

Fig. 4. Part of a colony from Mandapam (Palk Bay) x 1.

Fig. 5. Portion of another colony from Pulli Island x 1.

Fig. 6. Leptoria phrygia (Ellis and Solander), from Krusadai Island x 1.5

PLATE XIX



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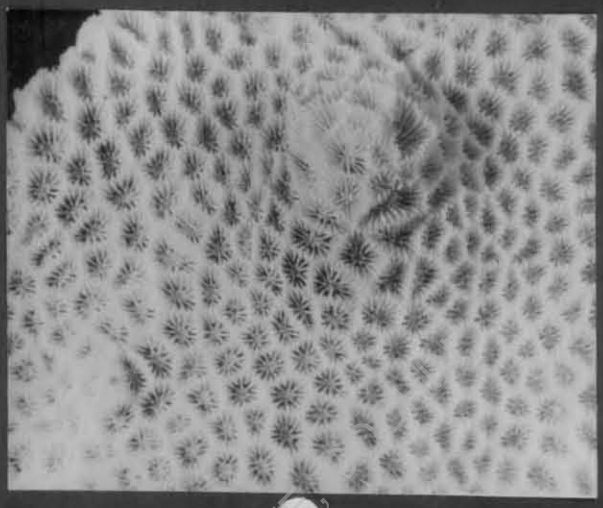

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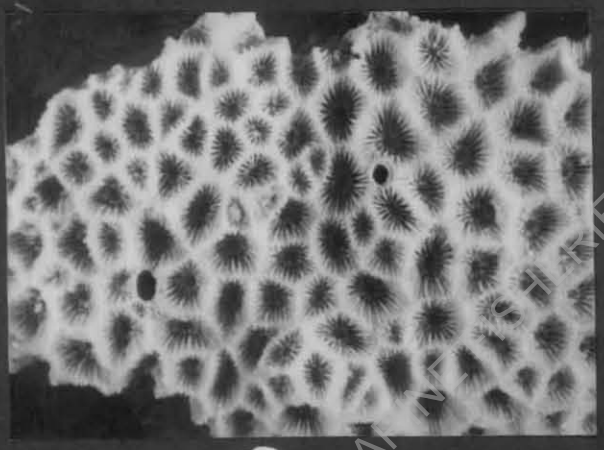

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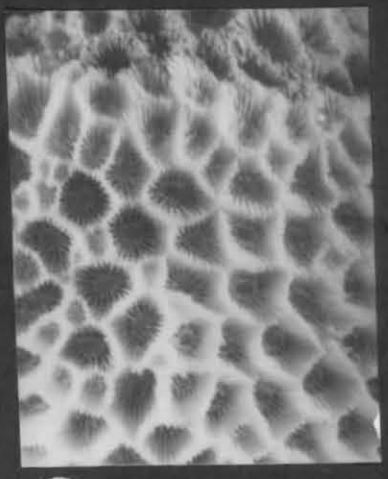

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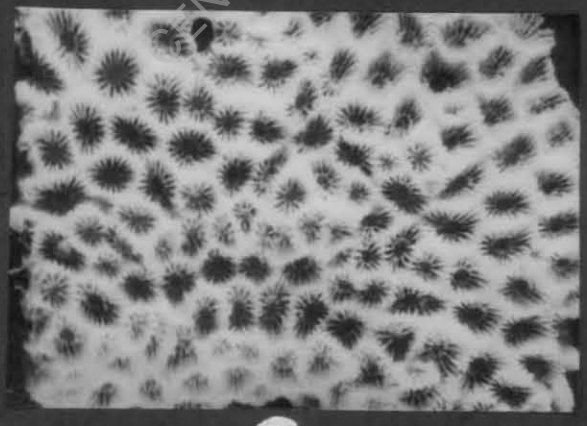

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EXPLANATION OF PLATE XX

Fig. 1. Hydnophora microconos (Lamarck), from Chetlat Island x 1.

Fig. 2. Hydnophora grandis Gardiner, from Mandapam (Palk Bay) part of a corallum x 1.

Figs.3-4. Leptastrea purpurea (Dana), from Mandapam (Palk Bay)

Fig. 3. Typical purpurea facies x 1.4

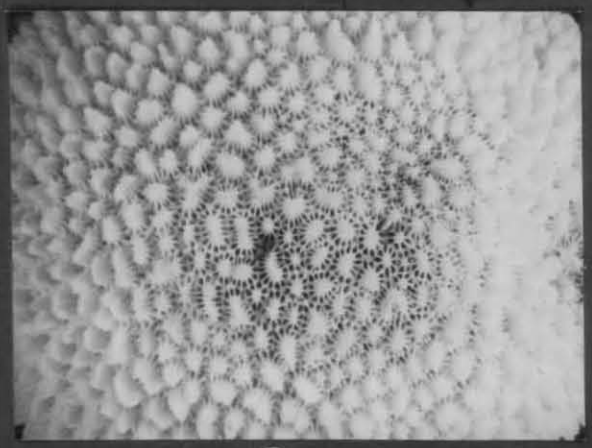
Fig. 4. ehrenbergana facies x 1.2

Figs.5-6. Leptastrea transversa (Klunzinger), from Mandapam (Palk Bay).

Fig. 5. Part of a corallum with numerous newly formed buds x 1.

Fig. 6. Part of another specimen with calices possessing lesser numbers of septa x 1.2

PLATE XX



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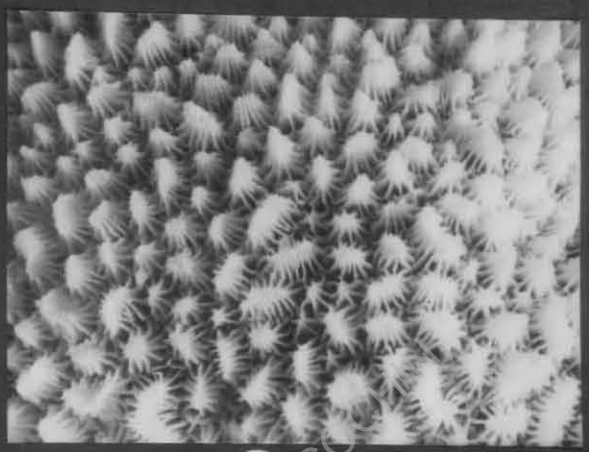

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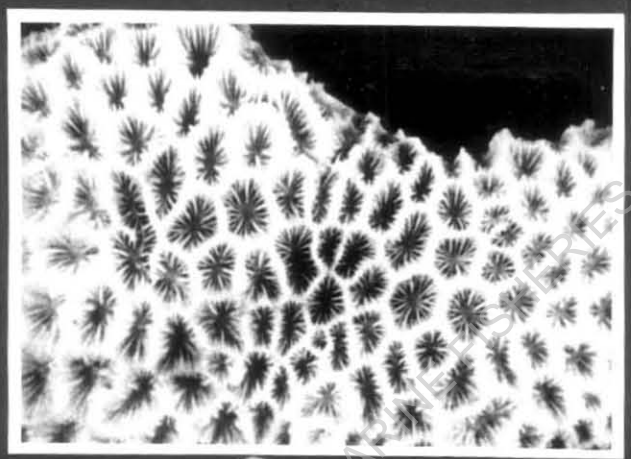

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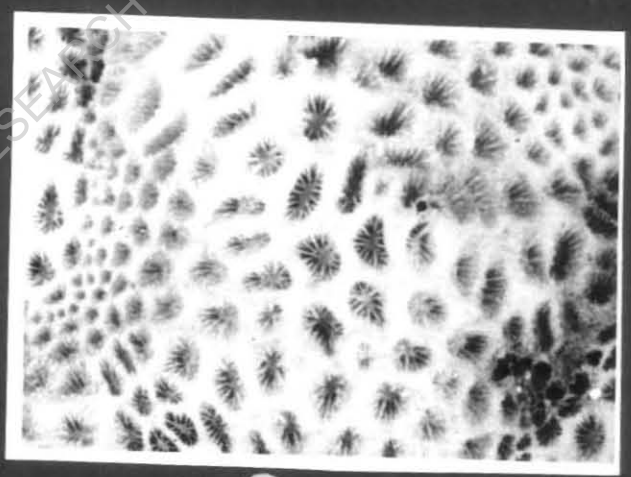

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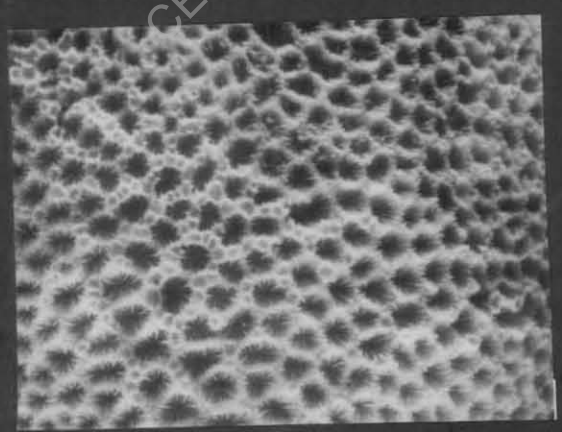

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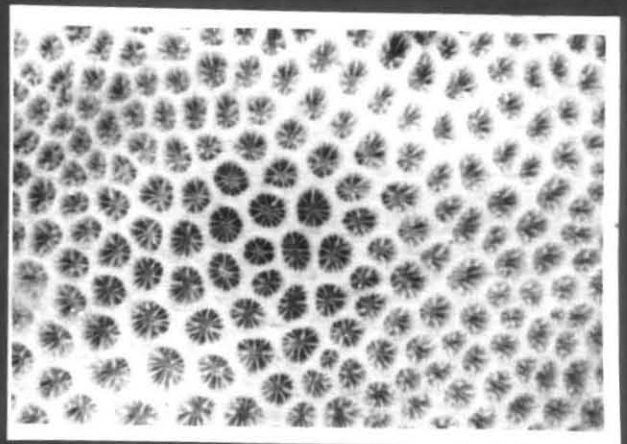


6

EXPLANATIONS OF PLATE XXI

Fig. 1. Oulastrea crispata (Lamarck), from Andamans x 2.

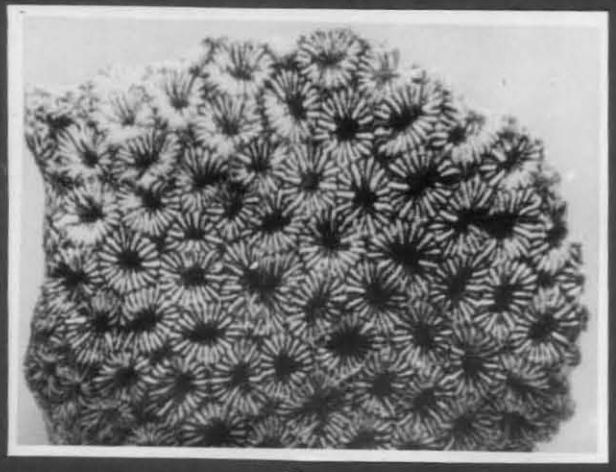
Fig. 2. Cyphastrea serialia (Forskal), from Mandapam (Palk Bay). x 2.

Fig. 3. Cyphastrea chalcidicum (Forskal), from Mandapam (Palk Bay) x 2.

Fig. 4. Echinopora lamellosa (Esper), from Manauli Island, under side of a frond showing buds x 2.

Figs.5-6. Echinopora gemmacea (Lamarck) from Krusadai Island.
Fig. 5. An entire colony x ½.
Fig. 6. Same calicinal side x 1.3

PLATE XXI



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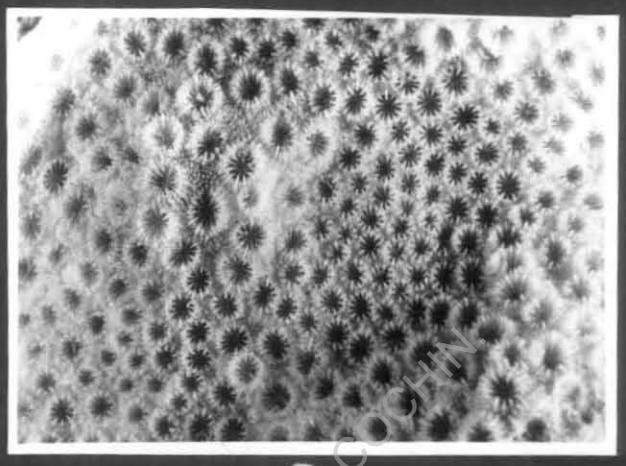

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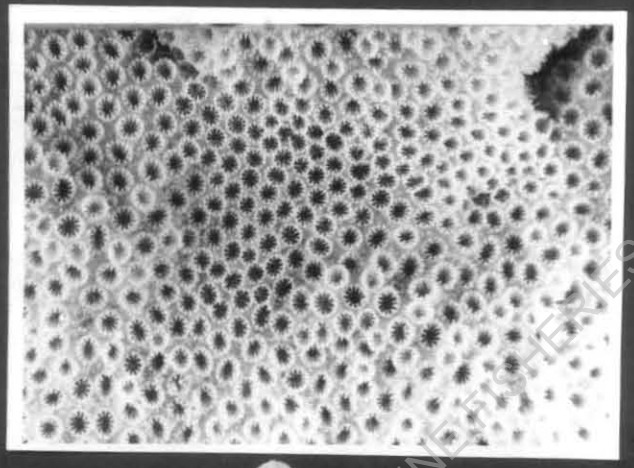

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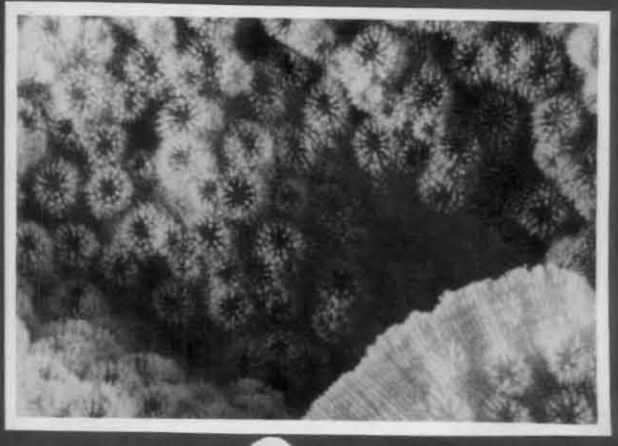

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EXPLANATION OF PLATE XXII

Fig. 1. *Culicia rubeola* (Quoy and Gaimard), from Manauli Island x 3.

Fig. 2. *Galaxea fascicularis* (Linnaeus), from Chetlat Island x 1.

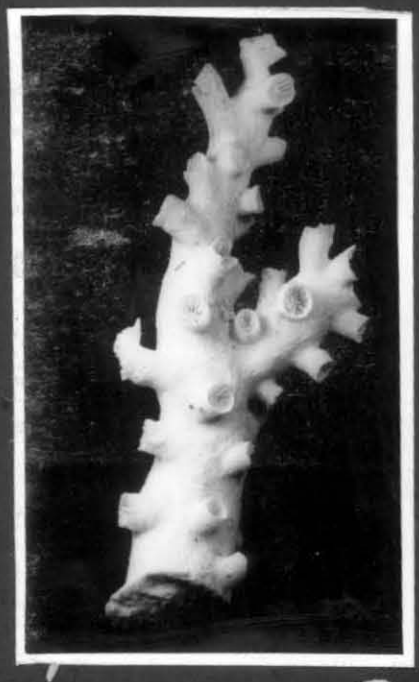
Fig. 3. *Galaxea clavus* (Dana), from Mandapam (Palk Bay) x 1.5

Fig. 4. *Symphyllia radians* Milne Edwards and Haime, from Mandapam (Palk Bay) x ½.

Fig. 5. *Mycedium tubifex* (Dana), from Mandapam (Palk Bay), peripheral part of a colony x 1.

Fig. 6. *Trochocyathus* sp., from Manauli Island x 3.

PLATE XXIV



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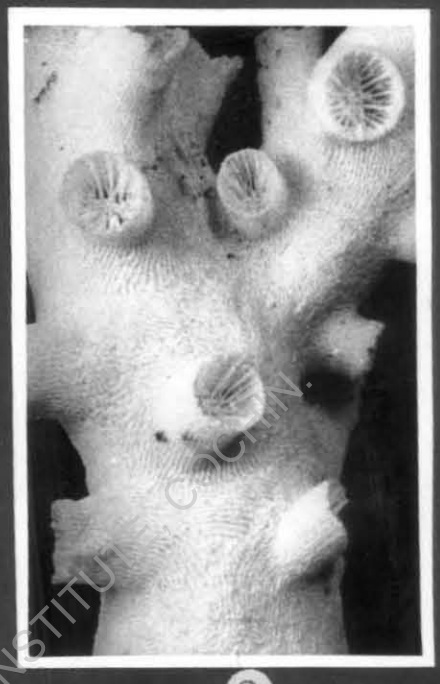

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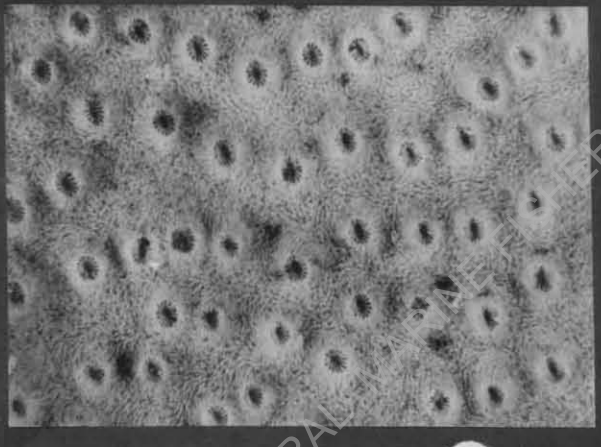

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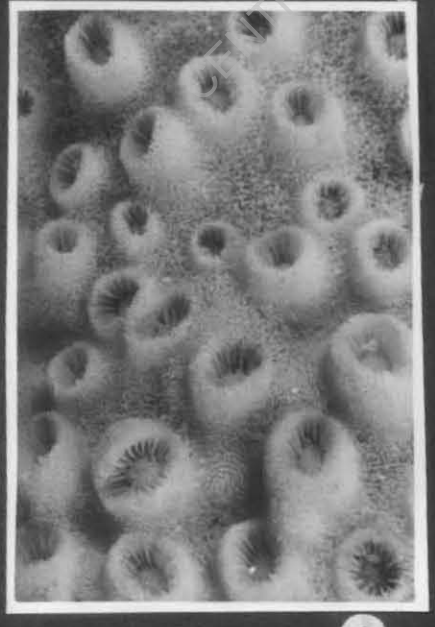

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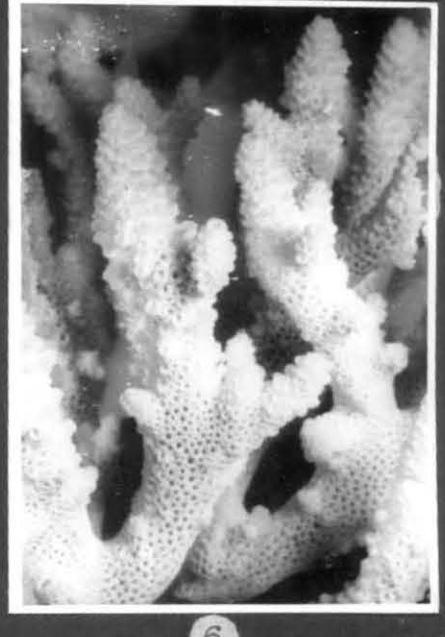

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EXPLANATION OF PLATE XXIII

Fig. 1. Paracyathus parvulus Gardiner, from Manauli Island, several corallites attached to a limestone. Upper part of the figure shows two corallites in fusion x 4.

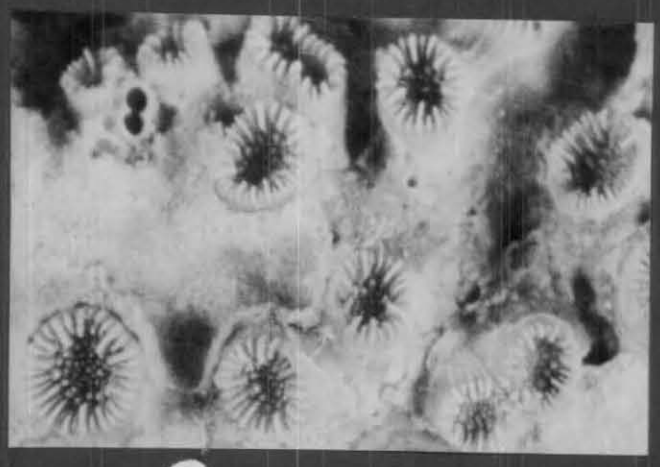
Figs.2-3. Euphyllia glabrescens (Chamisso and Esynhardt).
Fig. 2. Part of a colony from Minicoy x 1.5
Fig. 3. Part of a colony from Chetlat Island x 1.5

Fig. 4. Endopsammia philippinensis Milne Edwards and Haime, from Manauli Island x 3.

Fig. 5. Dendrophyllia aurea (Quoy and Gaimard), a colony from Manauli Island x 1.5

Fig. 6. Dendrophyllia indica sp. nov., paratype from Tuticorin x 1.5

PLATE XXIII



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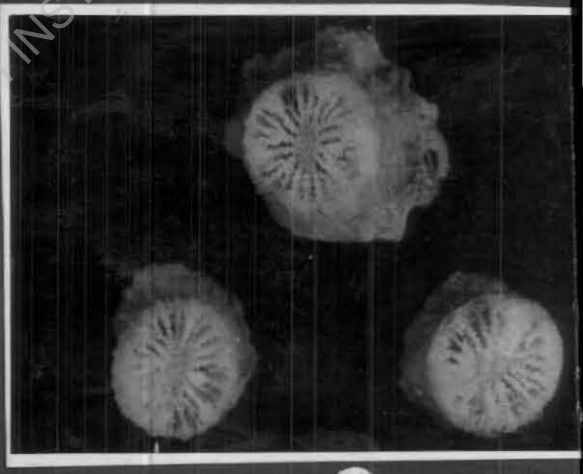

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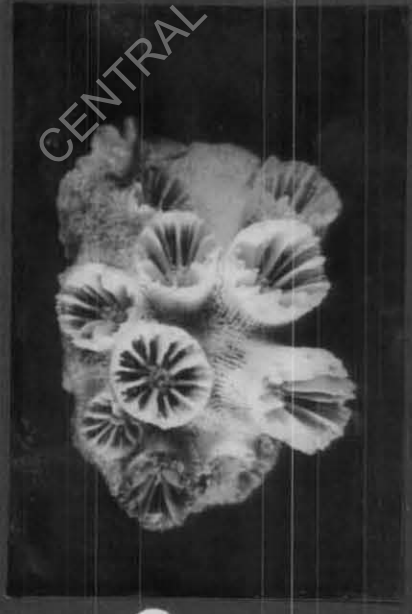

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6

EXPLANATION OF PLATE XXIV

Figs.1-2. *Dendrophyllia indica* sp. nov., holotype, from Tuticorin.

Fig. 1. Entire specimen x 0.4

Fig. 2. Part of the same x 1.

Fig. 3. *Turbinaria quincuncialis* Ortmann, from Tuticorin, calicinal surface x 2.5

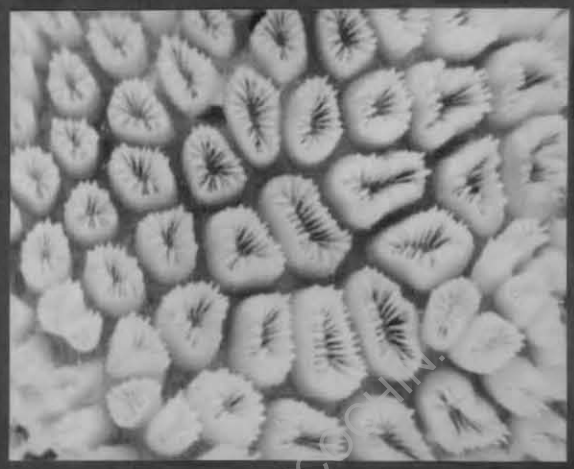
Fig. 4. *Turbinaria mesenterina* (Lamarck), from Manauli Island, part of a specimen x ½.

Fig. 5. *Turbinaria peltata* (Esper), from Mandapam (Gulf of Mannar), showing projecting corallites x 2.

Fig. 6. *Acropora pharaonis* Milne Edwards and Haime, from Mandapam (Palk Bay), part of a colony x 1.

PLATE XXII

1



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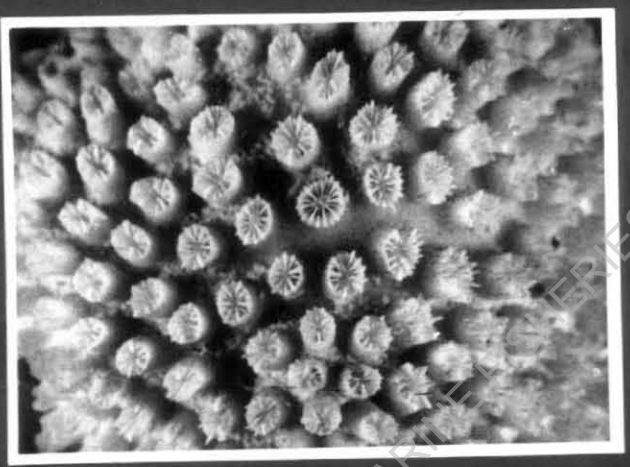

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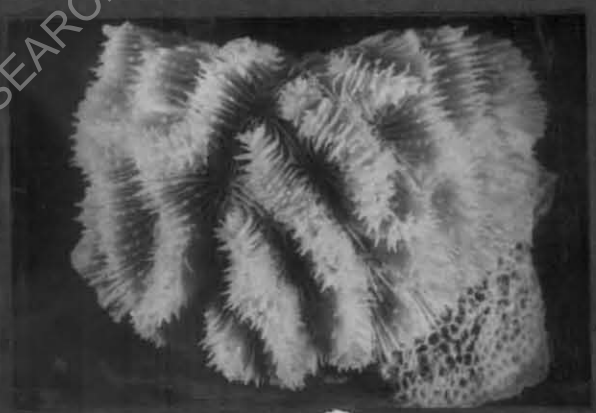

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